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PANASONIC CT-1388YD SERVICE MANUAL

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Service Manual

Color Television/Monitor/Receiver

Main Manual

(NA7D)

Panasonic

Models	Chassis
CT-1388YD	**JP358**
CT-1389VYD	**KP358**
CT-2088YD	**VP360**
CT-2089VYD	**WP360**
CT-2788YD	**GP363**
CT-2789VYD	**HP363**

This Service manual is issued as a service guide for the models of the **NA7D** family listed above. Included in this manual are a set of schematics, block diagrams, functional descriptions, alignment procedures, disassembly procedures, and a complete parts list.

"**WARNING!** This Service Manual is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. **Products powered by electricity should be serviced or repaired only by experienced professional technicians.** Any attempt to service or repair the product or products dealt with in this Service Manual by anyone else could result in serious injury or death."

The service technician is required to read and follow the "**Safety Precautions**" and "**Important Safety Notice**" in this Main Manual.

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Important Safety Notice

Special components are used in this television set which are important for safety. These parts are identified on the schematic diagram by the symbol ⚠ and printed in **BOLD TYPE** on the replacement part list. It is essential that these critical parts are replaced with the manufacturer's specified replacement part to prevent x-ray radiation, shock, fire or other hazards. Do not modify the original design without the manufacturer's permission.

Safety precautions

General Guidelines

An **isolation transformer** should always be used during the servicing of a receiver whose chassis is not isolated from AC power line. Use a transformer of adequate power rating as this protects the technician from accidents resulting in personal injury from electrical shocks. It will also protect the receiver from being damaged by accidental shorting that may occur during servicing.

When servicing, observe the original lead dress, especially in the high voltage circuit. Replace all damaged parts (also parts that show signs of overheating.)

Always replace protective devices, such as fishpaper, isolation resistors and capacitors, and shields after servicing the Receiver. Use only manufacturer's recommended rating for fuses, circuits breakers, etc.

High potentials are present when this receiver is operating. Operation of the receiver without the rear cover introduces danger for electrical shock. Servicing should not be performed by anyone who is not thoroughly familiar with the necessary precautions when servicing high-voltage equipment.

Extreme care should be practiced when **handling the picture tube**. Rough handling may cause it to implode due to atmospheric pressure. (14.7 lbs per sq. in.). Do not nick or scratch the glass or subject it to any undue pressure. When handling, use safety goggles and heavy gloves for protection. **Discharge the picture tube** by shorting the anode to chassis ground (not to the cabinet or to other mounting hardware). When discharging connect cold ground (i.e. dag ground lead) to the anode with a well insulated wire or use a grounding probe.

Avoid prolonged exposure at close range to unshielded areas of the picture tube to prevent exposure to X-ray radiation.

The **test picture tube** used for servicing the chassis at the bench should incorporate safety glass and magnetic shielding. The safety glass provide shielding for the tube viewing area against X-ray radiation as well as implosion. The magnetic shield limits the X-ray radiation around the bell of the picture tube in addition to the restricting magnetic effects. When using a picture tube test jig for service, ensure that the jig is capable of handling **35kV** without causing X-ray radiation.

Before returning a serviced receiver to the owner, the service technician must thoroughly test the unit to ensure that is completely safe to operate. **Do not use a line isolation transformer when testing.**

Leakage current cold check

Unplug the AC cord and connect a jumper between the two plug prongs.

Measure the resistance between the jumpered AC plug and expose metallic parts such as screwheads, antenna terminals, control shafts, etc.

If the exposed metallic part has a return path to the chassis, the reading should be between 240kΩ and 5.2MΩ. If the exposed metallic part does not have a return path to the chassis, the reading should be infinite.

Leakage current hot check (see Fig. 1)

Plug the AC cord directly into the AC outlet. Do not use an isolation transformer during the check.

Connect a 1.5kΩ 10 watt resistor in parallel with a 0.15μF capacitor between an exposed metallic part and ground. Use earth ground, for example a water pipe.

Using a DVM with a 1000 ohms/volt sensitivity or higher, measure the AC potential across the resistor.

Repeat the procedure and measure the voltage present with all other exposed metallic parts.

Verify that any potential does not exceed 0.75 volt RMS. A leakage current tester (such a Simpson Model 229, Sencore model PR57 or equivalent) may be used in the above procedure, in which case any current measure must not exceed 0.5 milliamp. If any measurement is out of the specified limits, there is a possibility of a shock hazard and the Receiver must be repaired and rechecked before it is returned to the customer.

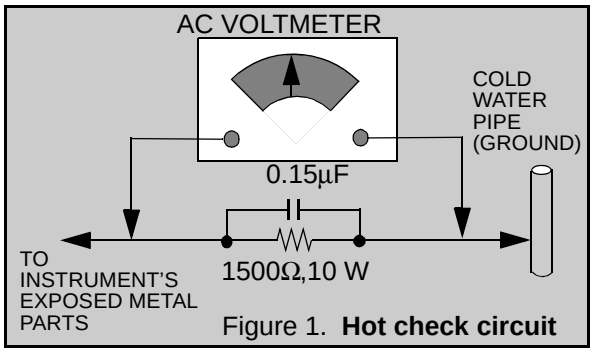

Figure 1. **Hot check circuit**

X-ray radiation

WARNING: The potential source of x-ray radiation in the TV set are the High Voltage section and the picture tube. Refer to **X-RAY PROTECTION CIRCUIT CHECK** in service notes in this manual to confirm HHS voltage.

High voltage (CRT anode)

Confirm anode voltage is within limits:

Set the BRIGHTNESS, PICTURE, SHARPNESS and COLOR to minimum (to obtain a dark image). Measure high voltage. It should be:

23.75±1.25kV for 13", 27.70±1.25kV for 20" and 29.25±1.25kV for 27".

If the upper limit is out of tolerance, immediate service and correction is required.

Note: *It is important to use an accurate, calibrated high voltage meter.*

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Service notes

Note: *These components are affixed with glue. Be careful not to break or damage any foil under the component or at the pins of the ICs when removing. Usually applying heat to the component for a short time while twisting with tweezers will break the component loose.*

Surface mount chip component

Chip components must be replaced with identical chips due to critical foil track spacing. There are no holes in the board to mount standard transistors or diodes. Some chips capacitor or resistor board solder pads may have holes through the board, however the hole diameter limits standard resistor replacement to 0.125 watt. Standard capacitor may also be limited for the same reason. It is recommended that identical components be used.

Chip resistor have a three digit numerical resistance code - 1st and 2nd significant digits and a multiplier. Example: 162 = 1600 or 1.6kΩ resistor, 0 = 0Ω (jumper).

Chip capacitors generally do not have the value indicated on the capacitor. The color of the component indicates the general range of the capacitance.

Chip transistors are identified by a two letter code. The first letter indicates the type and the second letter, the grade of transistor.

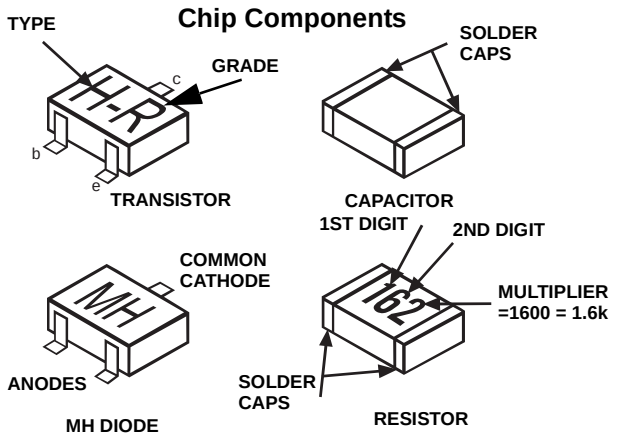
Chip diodes have a two letter identification code as per the code chart and are a dual diode pack with either common anode or common cathode. Check the parts list for correct diode number.

Component removal

1. Use solder wick to remove solder from component end caps or terminal.
2. Without pulling up, carefully twist the component with tweezers to break the adhesive.
3. Do not reuse removed leadless or chip components since they are subject to stress fracture during removal.

Chip component installation

1. Put a small amount of solder on the board soldering pads.
2. Hold the chip component against the soldering pads with tweezers or with a miniature alligator clip and apply heat to the pad area with a 30 watt iron until solder flows. Do not apply heat for more than 3 seconds.

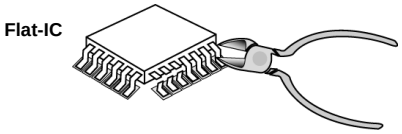


How to replace flat-IC

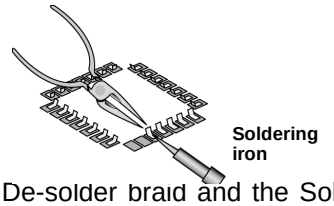
- Required Tools -

- Soldering iron
- De-solder braids
- Sharpen pliers (wire cutters and long nose)
- Magnifier

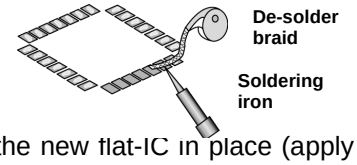
1. Cut the pins of the defective IC with the wire cutters pliers, and remove it completely away from the board. If the IC is glued to the board, apply hot air to complete the removal. **CAUTION**- Do not pull or twist the pliers, may damage the soldering pads in the board.



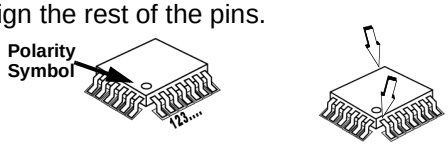
2. Using the soldering Iron and the long nose pliers, remove the IC pins that still attached to the board.



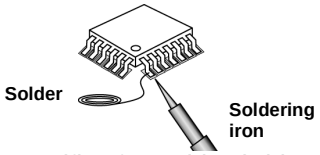
3. Using the De-solder braid and the Soldering Iron, remove the solder from the board soldering pads.



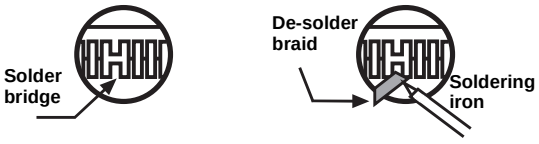
4. Position the new flat-IC in place (apply the pins of the flat-IC to the soldering pads where the pins need to be soldered). Properly determine the positions of the soldering pads and pins by correctly aligning the polarity symbol. Start aligning and soldering Pin No.1, then align and solder the pin in the apposite corner of the IC, this will help to align the rest of the pins.



5. Solder all pins to the soldering pads using a fine tipped soldering iron.



6. Check with a magnifier for solder bridge between the pins or for dry joint between pins and soldering pads. To remove a solder bridge, use a de-solder braid as shown in the figure below.



Service Notes *(continued)*

IMPORTANT: To protect against possible damage to the solid state devices due to arcing or static discharge, make certain that all ground wires and CTR DAG wire are securely connected.

CAUTION: The power supply circuit is above earth ground and the chassis cannot be polarized. Use an isolation transformer when servicing the receiver to avoid damage to the test equipment or to the chassis. Connect the test equipment to the proper ground (⏚) or (⏚) when servicing, or incorrect voltages will be measured.

WARNING: This receiver has been designed to meet or exceed applicable safety and x-ray radiation protection as specified by government agencies and independent testing laboratories.

To maintain original product safety design standards relative to X-ray radiation and shock and fire hazard, parts indicated with the symbol ⚠ on the schematic must be replaced with identical parts. Order parts from the manufacturer's parts center using the parts numbers shown in this service manual, or provide the chassis number and the part reference number.

For optimum performance and reliability, all other parts should be replaced with components of identical specification.

X-RAY protection circuit check

This test must be performed as final check before the Receiver is returned to the customer. If voltage is out of tolerance, immediate service and correction is required to insure safe operation and to prevent the possibility of premature component failure.

Equipment needed to check the protection circuit:

1. Isolator transformer.
2. High voltage meter.
3. Short jumper.
4. Diode connection jumper
   Use similar diode than D823, refer to parts list for part No., (Diode should support at least 150V.)

Procedure:

1. Connect receiver to isolator transformer.
2. Apply a monoscope pattern.
3. In service mode. (refer to service mode section) select register C0B.
4. Measure TP5 (TPs port close to tuner). Compare the measure of TP5 and set the data for C0B according the following table

TP5 MEASURE (V)	DATA TO C0B (Hex)
0 ~ 0.93	00
0.93 ~ 0.97	01
0.97 ~ 1.01	02
1.01 ~ 1.05	03
1.05 ~ 1.09	04
1.09 ~ 1.13	05
1.13 ~ 1.17	06
1.17 ~ 1.21	07

5. Exit service mode and turn receiver OFF.
6. Connect a jumper from TPD16 to TPD17.
7. Connect the *diode jumper*, cathode to TPD14 (COLD GND), anode to TPD15 (HOT GND).

   Note: *Refer to see Fig. 10 for test point location.*
8. Apply 75 V AC to the AC input of the Insulator transformer.Turn receive ON.
9. Set PICTURE and BRIGTHNESS to minimum.
10. Increase the AC voltage at the input of insulator transformer and confirm the HHS voltage is **29.1KV** for **13", 34.0kV** for **20"** and **35kV** for **27",** at the point set starts to loose sync,
11. Reset picture controls to original levels.
12. Turn the set OFF, and remove all jumpers and connections from chassis.

Receiver feature table

FEATURE\MODEL	CT-1388YD	CT-1388VYD	CT-2088YD	CT-2089VYD
Chassis No	JP358	KP358	VP360	WP360
Family	NA7D	NA7D	NA7D	NA7D
Tuning block	40k	40k	40k	40k
No of channels	NO TUNER	181	NO TUNER	181
Menu language	English / Spanish	English / Spanish	English / Spanish	English / Spanish
Closed caption	X	X	X	X
V-Chip	n/a	X	n/a	X
75 Ω input	n/a	X	n/a	X
Remote control	n/a	TV Only	n/a	TV Only
Picture tube supplier	SAMSUNG	SAMSUNG	AMEC	AMEC
Comb filter	2 Dig	2 Dig	2 Dig	2 Dig
V/A norm	V	V	V	V
Built-in audio power	1.5W x 2 (10%)	1.5W x 2 (10%)	1.5W x 2 (10%)	1.5W x 2 (10%)
No. of speakers	1	1	1	1
AI sound	n/a	n/a	n/a	n/a
Video in rear	3 BNC	3 BNC	3 BNC	3 BNC
Audio in rear	3 RCA	3 RCA	3 RCA	3 RCA
Video program out	3 BNC	3 BNC	3 BNC	3 BNC
Audio program out	3 RCA	3 RCA	3 RCA	3 RCA
S-VHS (input/output)	1/1	1/1	1/1	1/1
EPJ/HPJ/MISC	EPJ	EPJ	n/a	n/a
Dimensions mm (WxDxH) in	359.2 x 395 x 337.3 14.1 x 15.6 x 13.3	359.2 x 395 x 337.3 14.1 x 15.6 x 13.3	515.7x490.5x461.7 20.30x19.31x18.17	515.7x490.5x461.7 20.30x19.31x18.17
Weight (kg/lbs)	9 / 19.8	9 / 19.8	19 / 41.8	19 / 41.8
Anode voltage	23.75 ± 1.25 kV	23.75 ± 1.25 kV	27.70 ± 1.25 kV	27.70 ± 1.25 kV
A-Board TNP2AH024	EM	EN	FB	FC
C-Board TNP2AA075	AE	AE	AD	AD
X-Board TNP2AA098	NIL	AA	NIL	AA
G-Board TNP2AA019	NIL	NIL	NIL	NIL
H-Board TNP2AA020	NIL	NIL	NIL	NIL

Table 1. **receiver features**

***Note:** When ordering a board, add and " S" after the board suffix application.*
Example, If order A-Board for **CT-1388YD***, should be ordered as:* **TNP2AH024EMS***.*

Specifications are subject to change without notice or obligation.
Dimensions and weights are approximate.

Receiver feature table

FEATURE\MODEL	CT-2788YD	CT-2789VYD
Chassis No	GP363	HP363
Family	NA7D	NA7D
Tuning block	40k	40k
# of channels	NO TUNER	181
Menu language	English / Spanish	English / Spanish
Closed caption	X	X
V-Chip	n/a	X
75 Ω input	n/a	X
Remote control	n/a	TV Only
Picture tube supplier	AMEC	AMEC
Comb filter	2 Dig	2 Dig
V/A norm	V	V
Built-in audio power	3.5W x 2 (10%)	3.5W x 2 (10%)
No. of speakers	2	2
AI sound	n/a	X
Video in rear	1 BNC	1 BNC
Audio in rear	1 Set stereo RCA	1 Set stereo RCA
Video program out	1 BNC	1 BNC
Audio program out	1 Set stereo RCA	1 Set stereo RCA
S-VHS (input/output)	1/1	1/1
EPJ/HPJ/MISC	n/a	n/a
Dimensions mm (WxDxH) in	731 x 684 x 614 28.8 x 26.9 x 24.2	731 x 684 x 614 28.8 x 26.9 x 24.2
Weight (kg/lbs)	35 / 77.2	35 / 77.2
Anode voltage	29.25 ± 1.25 kV	29.25 ± 1.25 kV
A-Board TNP2AH024	BL	BM
C-Board TNP2AA075	AG	AG
X-Board TNP2AA098	AB	AC
G-Board TNP2AA019	AD	AC
H-Board TNP2AA020	NIL	NIL

Table 1. **receiver features**

***Note:** When ordering a Board, add and " S" after the board suffix application. Example, if order A-Board for* **CT-2788YD**, *should be ordered as:* **TNP2AH024BLS**.

Specifications are subject to change without notice or obligation.
Dimensions and weights are approximate.

Location of controls (receiver)

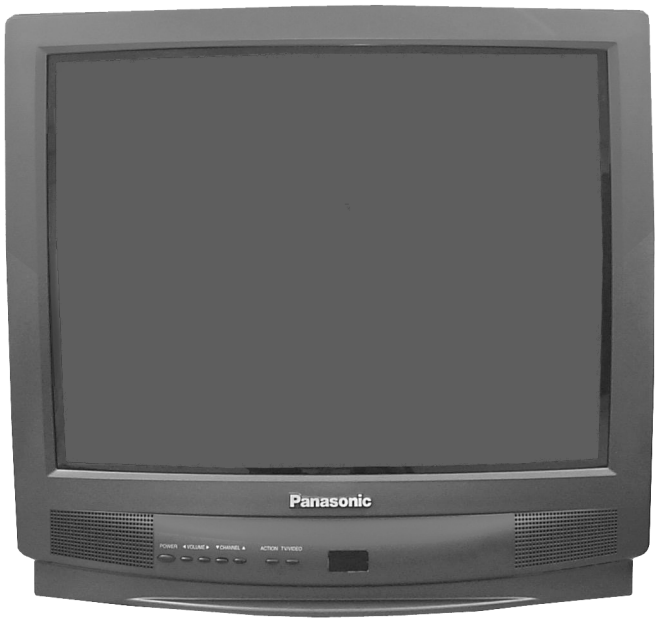
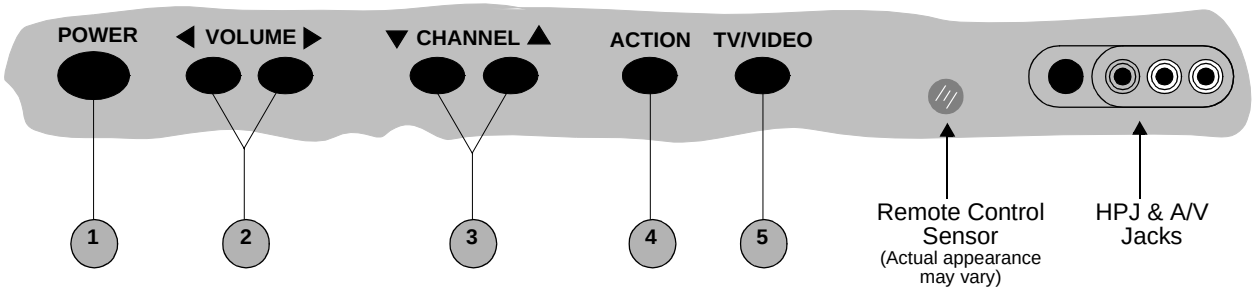


Figure 2. **Location of controls (receiver) -- CT-2789VYDE.**



Quick reference control operation

Quick reference control operation	
1	**POWER button -** Press to turn ON or OFF.
2	**VOLUME buttons -** Press to adjust sound level, or to adjust audio menus, video menus, and select operating features when menus are displayed
3	**CHANNEL buttons -** Press to select programmed channels. Press to highlight desired features when menus are displayed. Also use to select cable converter box channels after programming remote control infra-red codes (the TV/AUX/CABLE switch must be set in CABLE position).
4	**ACTION button -** Press to display main menu and access on screen feature and adjustment menus.
5	**TV/VIDEO button -** Press to select TV or Video Input.

Location of controls (remote) Cont.

(for models with remote control)

POWER button
Press to turn ON and OFF.
MUTE button
Press to mute sound. A second press resumes sound. Press also to access and delete closed caption display.
TV/VIDEO button
Press to select TV or Video input.
VOLUME buttons
Press to adjust TV sound level. Use with channel buttons to navigate in menus.
CHANNEL buttons
Press to select channels. Use with volume buttons to navigate in menus.
ACTION button
Press to display main menu and access or exit on screen features and adjustment menus.
Keypad buttons
Press desired channel number to randomly access any channel.
R-TUNE (rapid tune) button.
Press to switch to the previous channel.
RECALL button
Press to display time, status of sleep timer, channel, video mode and channel caption (station identifier).

EUR501450

Figure 3. **Location of controls (remote)**.

Disassembly for service

Back cover

Remove all the screws marked with an arrow(◄) from the back of the receiver, see Fig. 7.

Note: *Screw configuration, type, and number of screws vary depending on the model of the receiver serviced and the application; various models are covered in this manual. Use same hardware when reassembling the receiver.*

- 2 screws at the top edge of the receiver.
- 2 screws at the lower corners of the receiver.
- 1 screw by the a/v jacks.
- 1 screw by the fly-back assembly.

A-Board - main chassis (may vary)

1. Pull carefully the tab in the chassis rail, at the left side of the main chassis, this will release the rail from the cabinet. See Fig 5.
2. Slide the chassis and rail completely out of the guide rails of the cabinet.
3. Stand the receiver on its edge. The underside of the board is completely accessible for component replacement.

Note: *Some tie-wraps that secure the wire dressings may need to be unfastened for chassis removal.*

4. When reassembly, place the chassis rail on the cabinet, then place the main chassis, be sure is in the rails at both sides, then push all the way to the front.

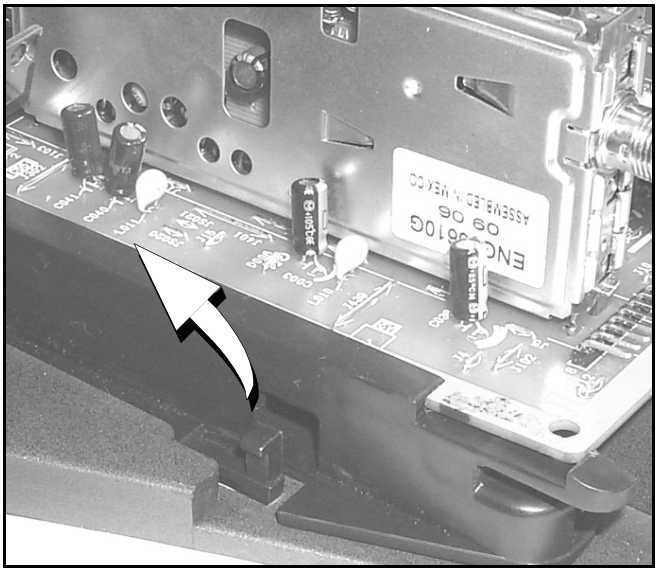


Figure 4. **Chassis rail detail**

C-Board - CRT output

Plugs into the socket on the CRT neck.
To release the focus wire, use a flat tool to release the tab in the socket, *see Fig. 5* ***A***, pull the wire-look up and remove the wire by pulling away the socket ***B,*** To re-insert, close the wire-look by pushing until is secured with the tab, and insert the wire into the socket

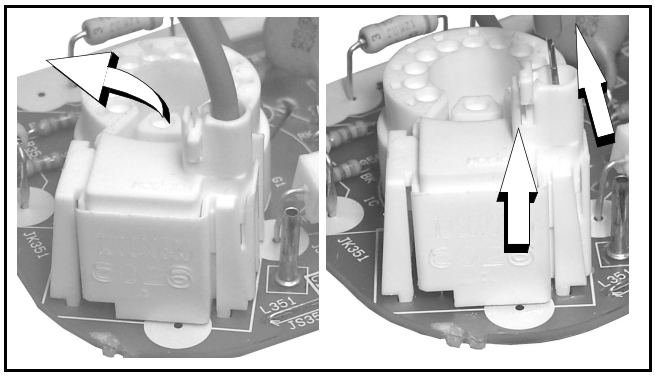


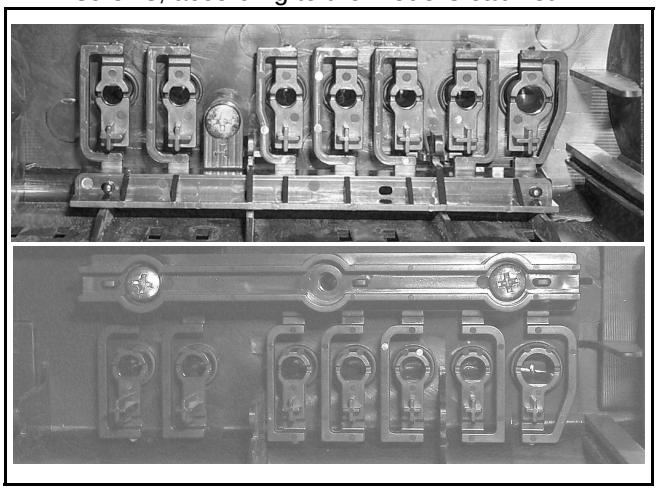
Figure 5. **Focus wire release**

Speakers

Speakers are secured to the front of the cabinet with 2 screws in diagonal (opposite corners).

Keyboard push button assembly

Fastened to the inside of the cabinet front with 1 or 2 screws, according to the model's cabinet.



Disassembly for CRT replacement

1. Discharge the CRT as instructed in the **safety precautions** (see page 2).
2. Disconnect the yoke (DY) plug and degaussing coil (DEG) plug from the main board.
3. Unplug the CRT 2nd anode button.
4. Remove the C-Board from the CRT base and unplug the black wire (CRT dag ground) C10.
5. Disconnect speakers plug SP from the A-Board.
6. Lift the main chassis (A-Board) completely out with the CRT board attached.

CRT replacement

1. Perform **disassembly for crt replacement** procedure.
2. Insure that the CRT H.V. Anode button is discharged before handling the CRT. Read the **safety precautions** (see page 2) on handling the picture tube.
3. Remove the components from the CRT neck and place the cabinet face down on a soft pad.
4. Note the original order for the CRT mounting hardware.
5. Remove the CRT with the degaussing coil and the dag ground braid attached.
6. Note the original locations and mounting of the degaussing coil and the dag ground assembly to insure proper reinstallation on the replacement CRT.

   To remove and remount the degaussing coil: The degaussing coil is held in place by 4 plastic ties fastened to the CRT corner ears. see Fig. 6 to remove Coil cut the plastic ties.

   - 4 plastic ties are included in the degaussing coil installation kit (refer to parts list for correct part No)

   To re-mount, place the two smaller plastic ties in the upper corners, holding the Coil, use the two bigger plastic ties to hold the Coil to the lower corners. Confirm the Coil is tense and fasten to the CRT body.

   To remove and remount the dag ground braid:
   a. Unhook the coil spring from the upper right corner of the CRT.
   b. Release the braid loop from the lower left corner of the CRT.

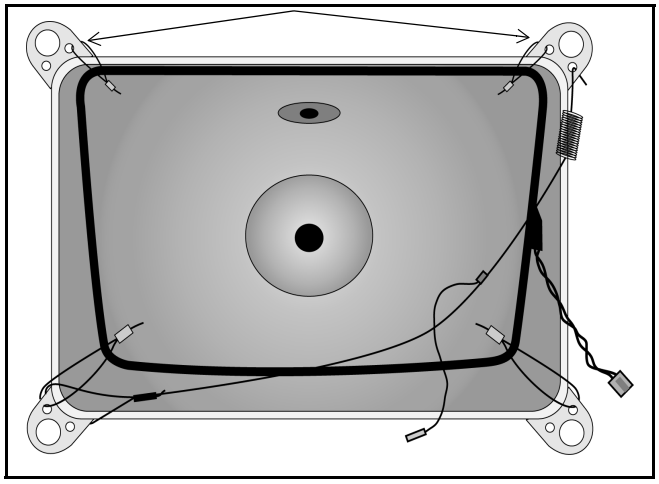


Figure 6. **Deg coil and DAG GND (may vary)**

7. Mount the dag ground braid on the replacement CRT as shown in Fig 7. Position the degaussing coil with new ties. Dress coil as was on the original CRT.
8. Replace the components on CRT neck and reinstall into cabinet. Verify that all ground wires and circuit board plugs get connected.

IMPORTANT
Screw number and configuration, A/V jacks and connectors may vary according to the model.

Back cover disassembly

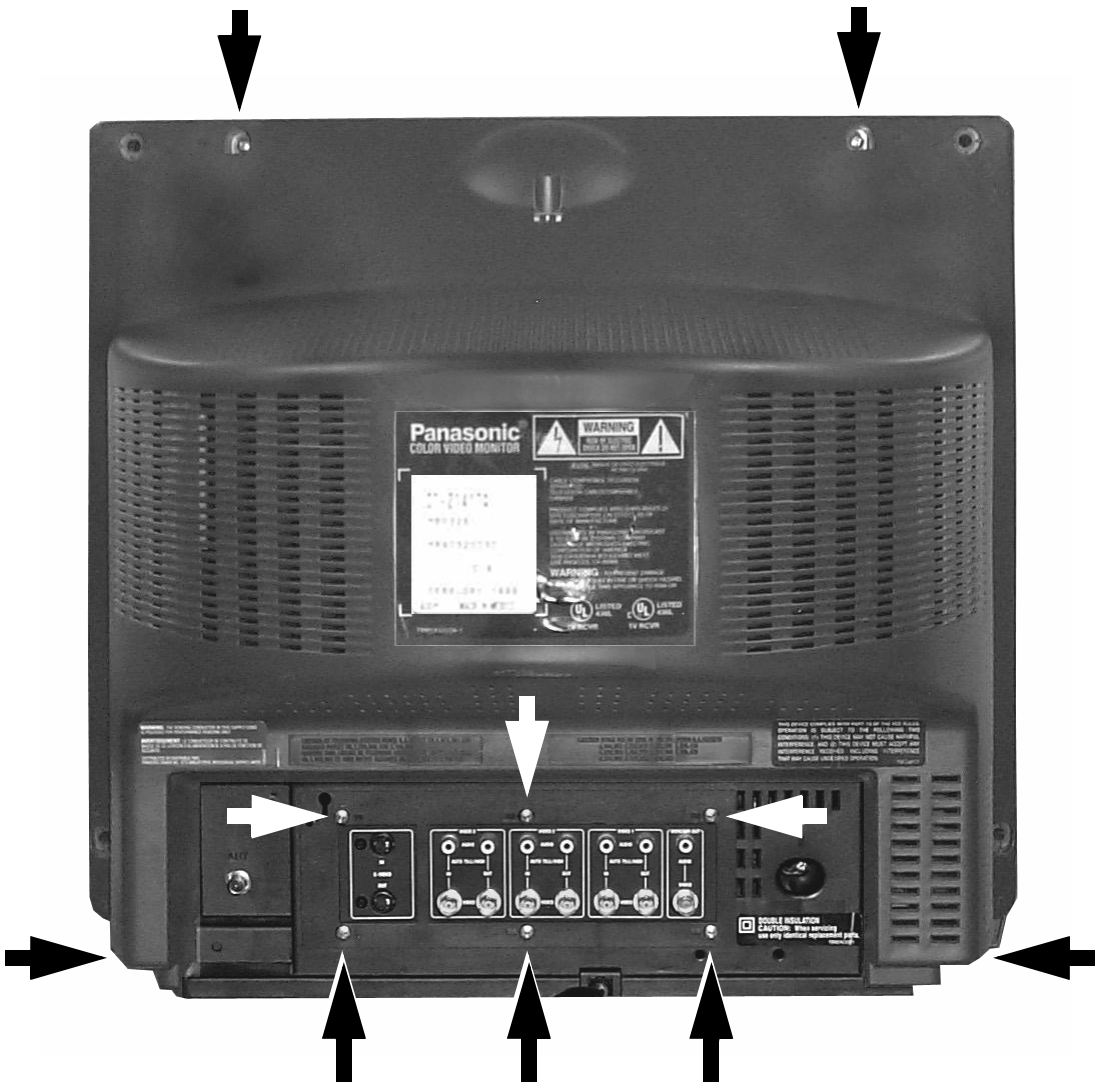


Figure 7. **Back cover removal (20” tuner model)**

- **2 screw at the top edge**
- **1 screw in each lower corner**
- **6 screw by the A/V board**

IMPORTANT
After servicing the receiver, remember to dress the cables a shown above.

Main components location

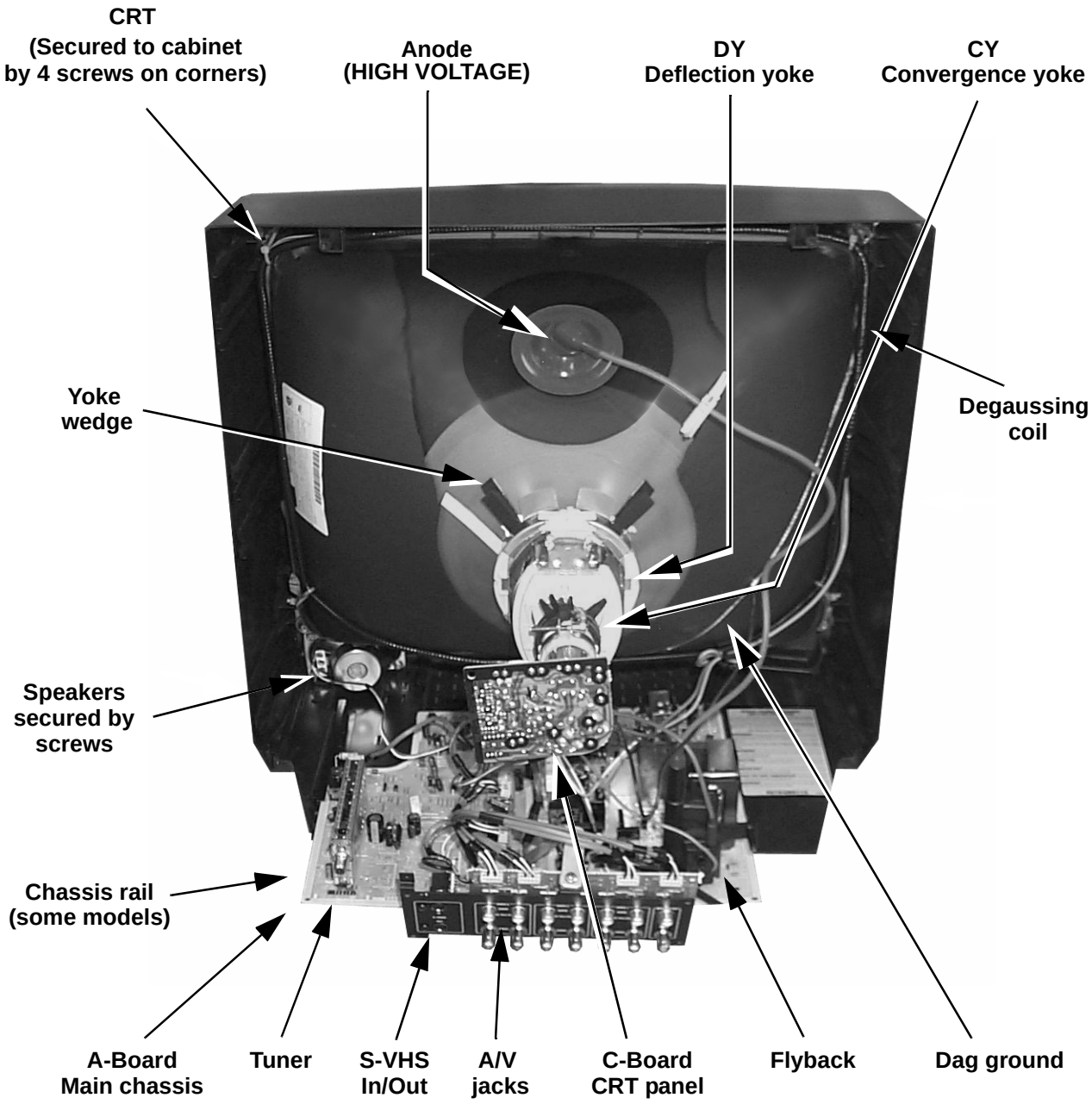


Figure 8. **Rear view**

Note: *Tuner may not be available on some models audio and video inputs may vary according to the model.*

Main components location

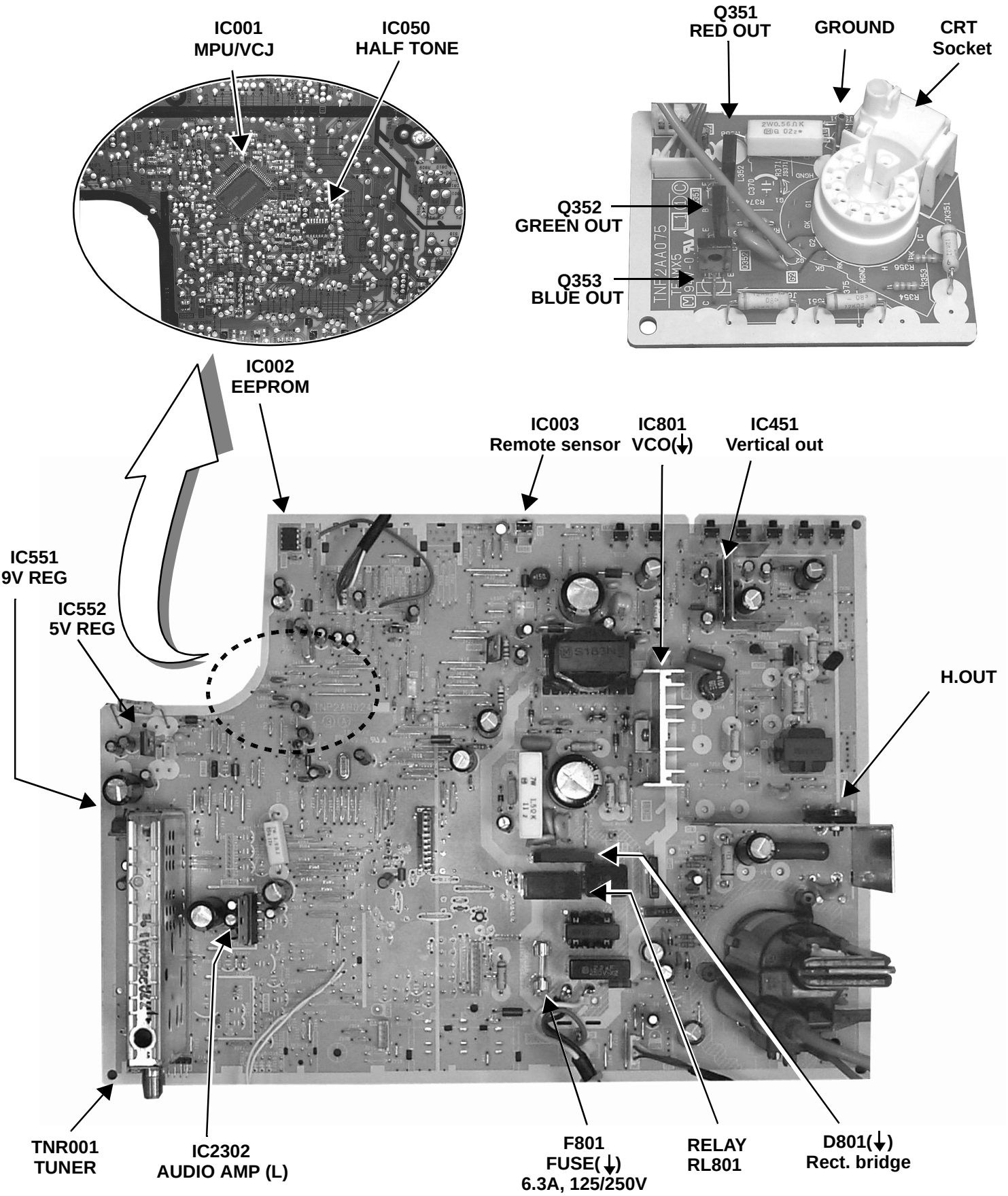


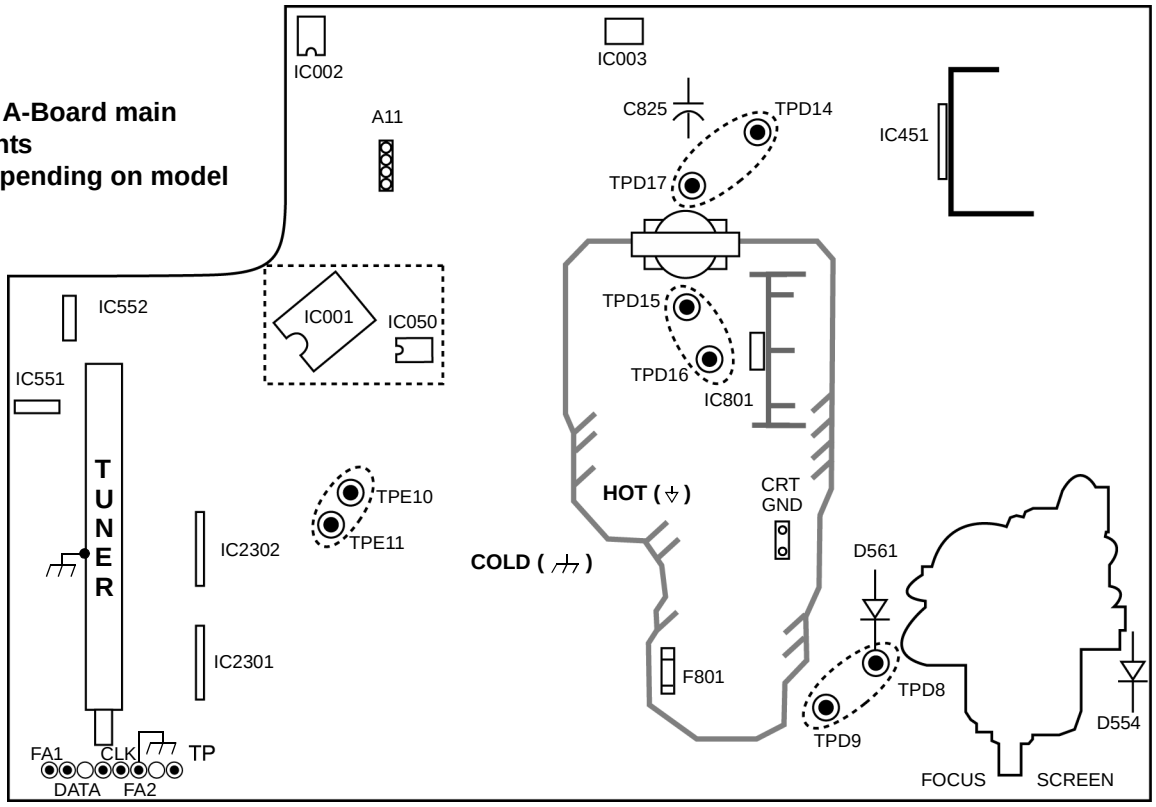
Figure 9. A-Board view (may vary depending on model)

Chassis service adjustment procedures

All service adjustments are factory preset and should not require adjustment unless controls and/or associated components are replaced.

Note: *Connect the (-) lead of the voltmeter to the appropriate ground. Use IC801's heat sink when the HOT ground symbol (⏚) is used. Otherwise, use COLD ground (⏚) — tuner shield, IC451's heat sink or FA2.*

Figure 10. **A-Board main components (varies depending on model**



COMPONENTS WITHIN DOT LINES ARE LOCATED AT THE OPOSITE SIDE OF BOARD.

130.0V B+ voltage confirmation

1. Set the **bright** and the **picture** to minimum by using the picture menu.
2. Connect the DVM between **C825(+ side)** and cold ground (⏚).
3. Confirm that B+ voltage is **130.0V ± 2.5V**. This voltage supplies B+ to the horizontal output & flyback circuits.

Source voltage chart

120V AC line input. Set the **bright** and the **picture** to minimum by using the picture menu. Use cold ground (⏚) for the (-) lead of the DVM.

	VOLTAGE	
LOCATION	**13"**	**20" & 27"**
TPD8	23.0V ± 2.0V	26.0V ± 2.0V
TPD9	13.0V ± 2.0V	13.0V ± 2.0V
IC552 Pin3	5.0V ± 0.25V	5.0V ± 0.25V
IC551 Pin3	9.0V ± 0.25V	9.0V ± 0.25V
D554 Cathode	180V ± 15V	200V ± 15V

Adjust picture menu for normalized video adjustments.

High voltage check

1. Select an active TV channel and confirm that horizontal is in sync.
2. Adjust brightness and picture using picture icon menu so video just disappears.
3. Confirm B+ 130V is within limit.
4. Using a high voltage meter confirm that the high voltage is:

23.75kV ± 1.25kV	**13"**
27.70kV ± 1.25kV	**20"**
29.25kV ± 1.25kV	**27"**

Purity and convergence procedure

Adjustment is necessary only if the CRT or the deflection yoke is replaced or if the setting was disturbed. The complete procedure consists of:

1. Vertical raster shift adjustment. **(Only for models with purity/convergence assembly with 4 pairs of rings)**.
2. Initial static convergence.
3. Setting the purity.
4. Final static convergence.

When the CRT or the yoke is replaced

Place the yoke on the CRT neck (do not tighten the clamp).

For a 2-piece assembly (see Fig. 11):

Position purity/convergence assembly as shown and tighten clamp snugly. Remove the hot-melt glue seal on assembly and position like tabs of purity device together at 12 o'clock to reduce its magnetic field effect.

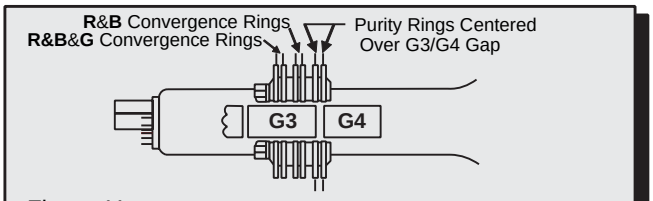


Figure 11. **Positioning of purity/convergence assembly (2-piece assembly)**

For models using 4 pairs of rings, place the vertical raster shift tabs at 3 o'clock (90º from the purity and convergence tabs, see Fig. 12 and see Fig. 13)

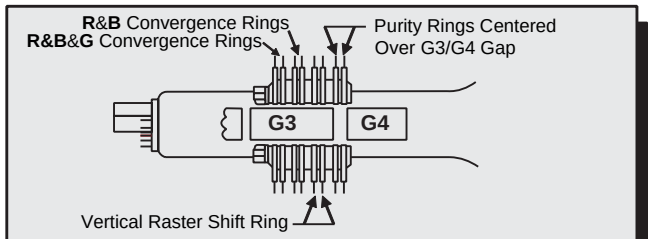


Figure 12. **Positioning of purity/convergence assembly (4 pairs of rings)**

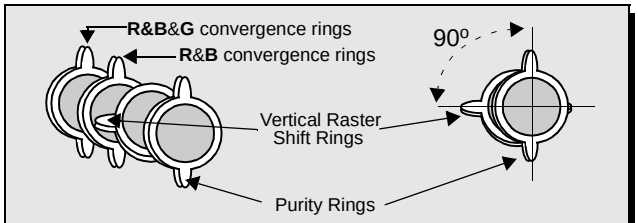


Figure 13. **Positioning of purity/convergence assembly (4 pairs of rings)**

For a 1-piece assembly (see Fig. 14):

Position like tabs of purity devices together at 12 o'clock to reduce any magnetic field effect. (For better results, note part number and look for specifications at service center)

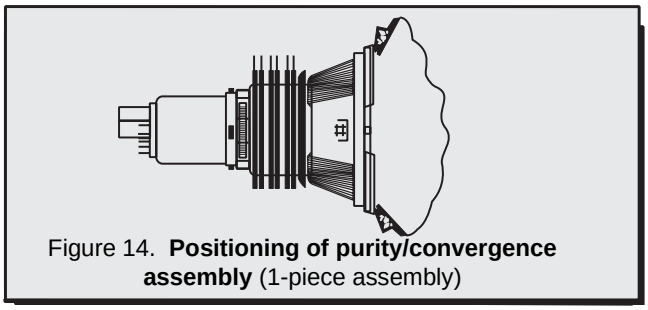


Figure 14. **Positioning of purity/convergence assembly** (1-piece assembly)

For either assemblies:

Turn the receiver ON. Operate the receiver for 60 minutes using the first purity check field (white screen) to stabilize the CRT.

Fully degauss the receiver by using an external degaussing coil.

Slide the deflection yoke back and forth on the neck of the CRT until it produces a near white, uniform raster.

Vertical raster shift adjustment **(only for models with purity/convergence assembly with 4 pairs of rings)**.

Apply a green pattern with a horizontal line, adjust the deflection yoke so that has no tilt, then secure it.

Adjust center line of the pattern with the mechanical center of the CRT, this center is determined by two marks at the side edges of the screen. To adjust the line, once the vertical raster shift tabs are place at 3 o'clock to reduce its magnetic field effect (see Fig. 12 and see Fig. 13) open the tabs the same angle from the center, until the center line of the pattern becomes a straight line, centered with the marks of the CRT. (see Fig. 15)

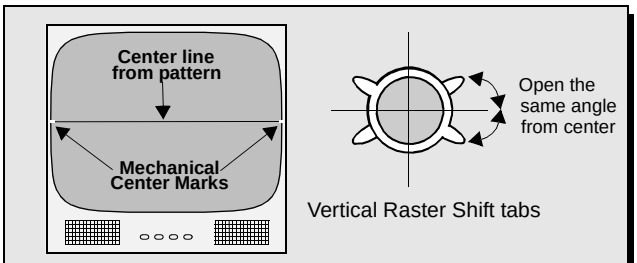


Figure 15. **Vertical Raster Shift Adjustment (4 pairs of rings assembly)**

Initial center static convergence

Connect a dot/cross hatch generator to the receiver and tune in a signal. Observe misconvergence at center of the screen only.
Adjust the R&B pole magnets; by separating tabs and rotating to converge blue with red.
Adjust the R&B&G pole magnets: by separating tabs and rotating to converge blue and red (magenta) with green.

> ***Note:*** *Precise convergence at this point is not important.*

Purity adjustment

When the receiver is in the service mode for making electronic adjustments, press the **recall** button on the remote control to enter purity check. (See the **service adjustments electronic controls** procedure).
Operate the receiver for 60 minutes using the first purity check field (white screen) to stabilize the CRT.
Fully degauss the receiver by using an external degaussing coil.
Press the **recall** button on the remote control again until the purity check (green screen) appears.

For a 2-piece assembly (see Fig. 11)**:**
Loosen the deflection yoke clamp screw and move the deflection yoke back as close to the purity magnet as possible.
Adjust the purity rings to set the vertical green raster precisely at the center of the screen (see Fig. 16).

NOTES:
1. CRT warm up with white screen (three guns activated) is needed to stabilize the shadow mask expansion.
2. Initial center static convergence (roughly centers three gun beams) is required in order to perform purity adjustment.

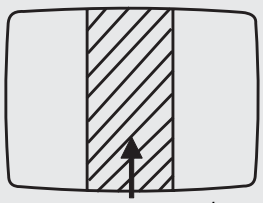


Figure 16. **Green raster adjustment**

Slowly move the deflection yoke forward until the best overall green screen is displayed.

For a 1-piece assembly (see Fig. 14)**:**
Slowly move the deflection yoke and purity rings assembly toward the CRT board and adjust the purity magnet rings to set vertical green raster at center of screen (see Fig. 16).
Gradually move the deflection yoke & purity rings forward and adjust for best overall green screen.

Continue from here for either assemblies:
Tighten the deflection yoke clamp screw.
Press the **Recall** button on the remote control again until the purity check (blue screen) and (red screen) appear and observe that good purity is obtained on each respective field.
Press the **Recall** button on the remote control again until purity check (white screen) appears. Observe the screen for uniform white. If purity has not been achieved, repeat the above procedure.

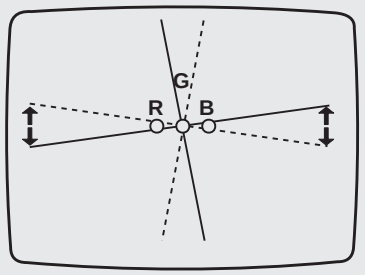
Final convergence procedure (see Fig. 17 through see Fig. 19):

> ***Note:*** *Vertical size and focus adjustments must be completed prior to performing the convergence adjustment. Connect a dot pattern generator to the receiver. The* ***Brightness*** *level should not be higher than necessary to obtain a clear pattern.*

Converge the red and the blue dots at the center of the screen by rotating the R&B pole static convergence magnets.
Align the converged red/blue dots with the green dots at the center of the screen by rotating the R&B&G pole static convergence magnets. Melt wax with soldering iron to reseal the magnets.
Slightly tilt vertically and horizontally (do not rotate) the deflection yoke to obtain a good overall convergence.
If convergence is not reached at the edges, insert permalloy (see following section) from the DY corners to achieve proper convergence. Re-check for purity and readjust if necessary.
After vertical adjustment of the yoke, insert wedge at 11 o'clock position, then make the horizontal tilt adjustment.
Secure the deflection yoke by inserting two side wedges at 3 and 7 o'clock positions.
Apply adhesive between tab (thin portion) of wedge and CRT and place tape over the tab to secure to the CRT.

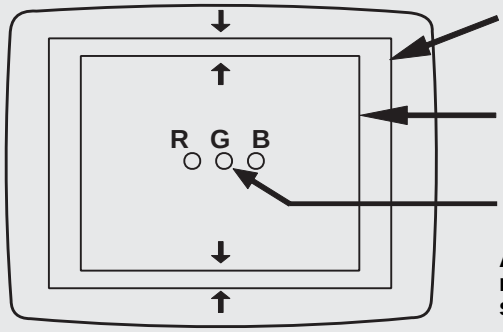
Permalloy convergence corrector strip (Part No. 0FMK014ZZ)

This strip is used in some sets to match the yoke and CRT for optimum convergence. If the yoke or CRT is replaced, the strip may not be required.
First converge the set without the strip and observe the corners.
If correction is needed:
1. Place strip between CRT and yoke, in quadrant needing correction. Slowly move it around for desired results.
2. Press adhesive tightly to the CRT and secure with tape.



As the yoke is tilted vertically, the rasters produced by the outside guns rotate in opposite directions.

Figure 17. **Vertical yoke movement**



Raster produced from one of the outside electron beams

Raster from the other side electron beam

Static convergence magnets are set for center convergence

As the yoke is tilted horizontally, one raster gets larger while the other gets smaller

Figure 18. **Horizontal yoke movement**

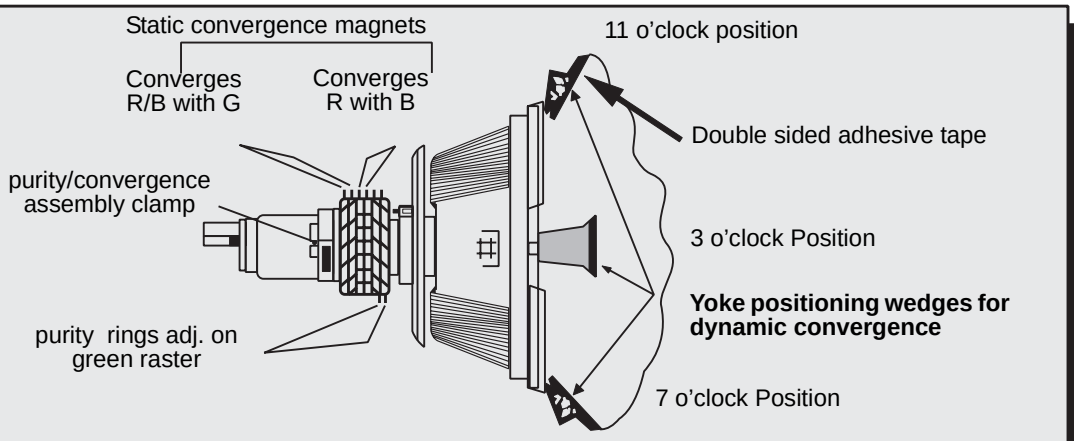


Figure 19. **Convergence magnets and wedges location**

Note: *For models using 4 pairs of rings assemblies see see Fig. 12 for*

Service mode (electronic controls)

This receiver has electronic technology using the I²C bus concept. It performs as a control function and it replaces many mechanical controls. Instead of adjusting mechanical controls individually, many of the control functions are now performed by using “on screen display Menu”. (The **service adjustment mode**)

Note: *It is suggested that the technician reads all the way through and understand the following procedure for entering/exiting the* ***service adjustment mode****; then proceed with the instructions working with the receiver. When becoming familiar with the procedure, the flow chart for serviceman mode may be used as a quick guide.*

Quick entry to service mode (models with remote control only, for models without remote see page 24 method):

At times when minor adjustments need to be done to the electronic controls, the method of entering the service mode without removal of the cabinet back is as follows using the remote control:

1. Select SET-UP icon and select CABLE mode.
2. Select TIMER icon and set SLEEP time for 30 min.
3. Press ACTION button twice to exit menus.
4. Tune to the Channel 124.
5. Adjust VOLUME to minimum (0).
6. Press the VOL ◀ button (decrease) **on receiver**. Red “CHK” appears in upper corner.

To toggle between aging and service modes:

While the “CHK” is displayed on the left top corner of the CRT, pressing the ACTION and the volume Up buttons on the receiver simultaneously will toggle between the modes. Red “CHK” for service and yellow “CHK” for aging (aging mode is used in the factory for quick operation).

7. **Press** the **power** button on the **remote control** to select one of service adjustment modes.
   1) **B**= Service VCJ SUB-DATA adjustments.
   2) **C**= Service VCJ CUT-OFF adjustments.
   3) **S**= Service OPTIONS (PICTURE) adjustments.
   4) **M**= Service MTS adjustments.
   5) **P**= Service VCJ adjustments.
   6) **X**= Service AFC adjustments
   7) “**CHK**” = Normal operation of CHANNEL ▲▼ and VOLUME ◀ ▶.

Note: *Only the applicable settings for the receiver serviced will be available (see* **a** *in see Fig. 20).*

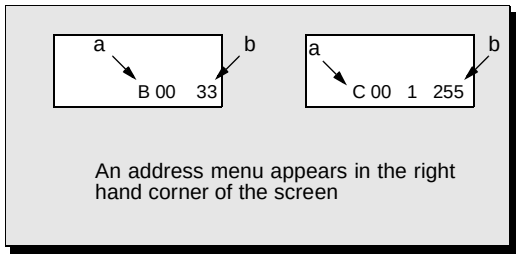


Figure 20. **Service mode menu adjustments.**

Exiting the service mode:

Press the **Action** and the **Power** buttons on the **Receiver** simultaneously for at least 2 seconds.

THE RECEIVER EXITS SERVICE MODE.

The receiver momentarily shuts off; then comes back on tuned to channel 3 with a preset level of sound. Any programmed channels, channels caption data and some others user defined settings will be erased.

IMPORTANT NOTE:
Always exit the service mode following adjustments.

IMPORTANT

Registers marked as **FIXED** in the following tables, are **factory preset**, service personnel **should not change** the default value.

Press the **power button** on the **remote control** to select the service adjustment.

For adjustments:

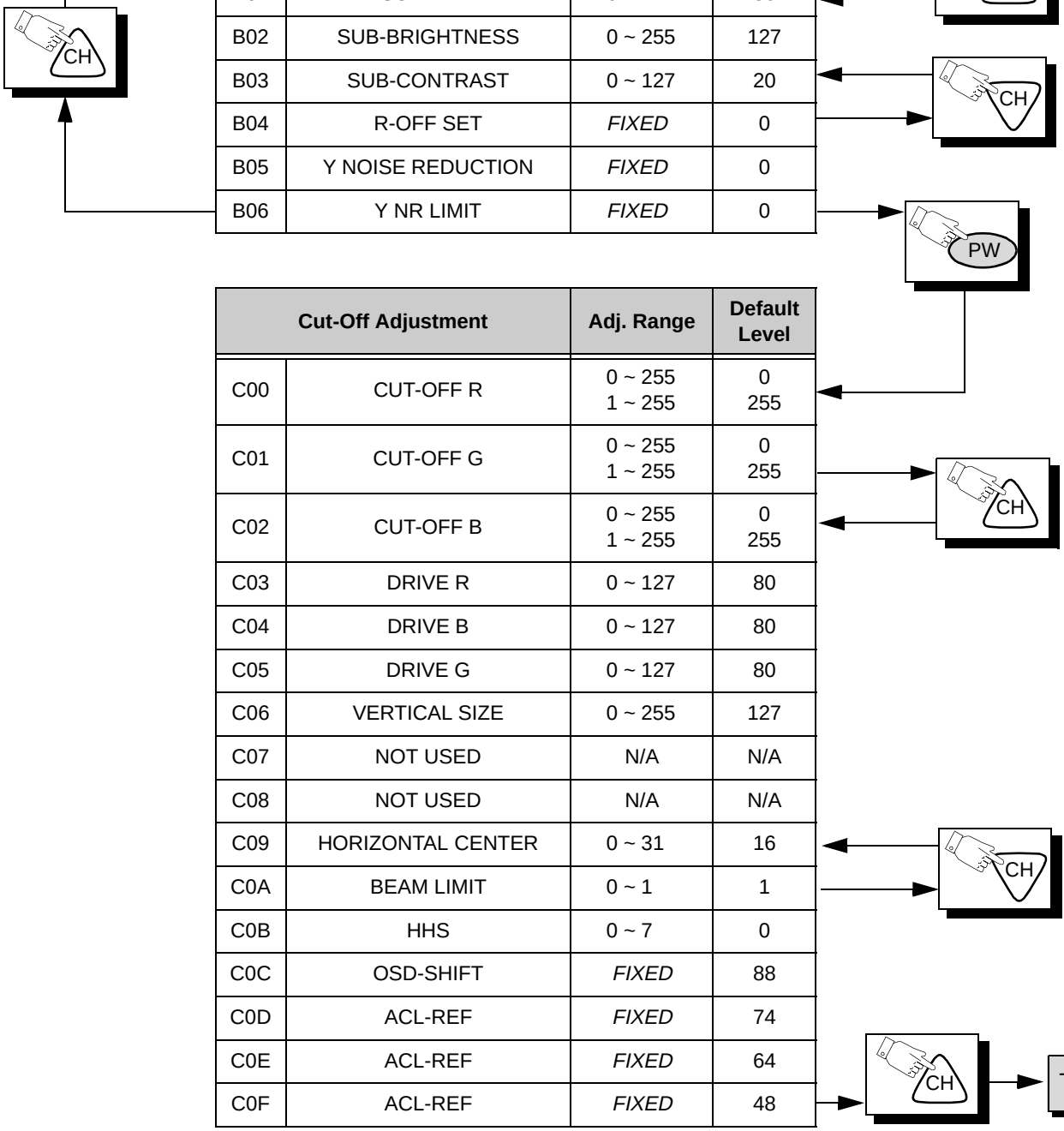
1. **Press channel Up/Down** on the **remote control** to select one of the available service adjustments (**a** in see Fig. 20).

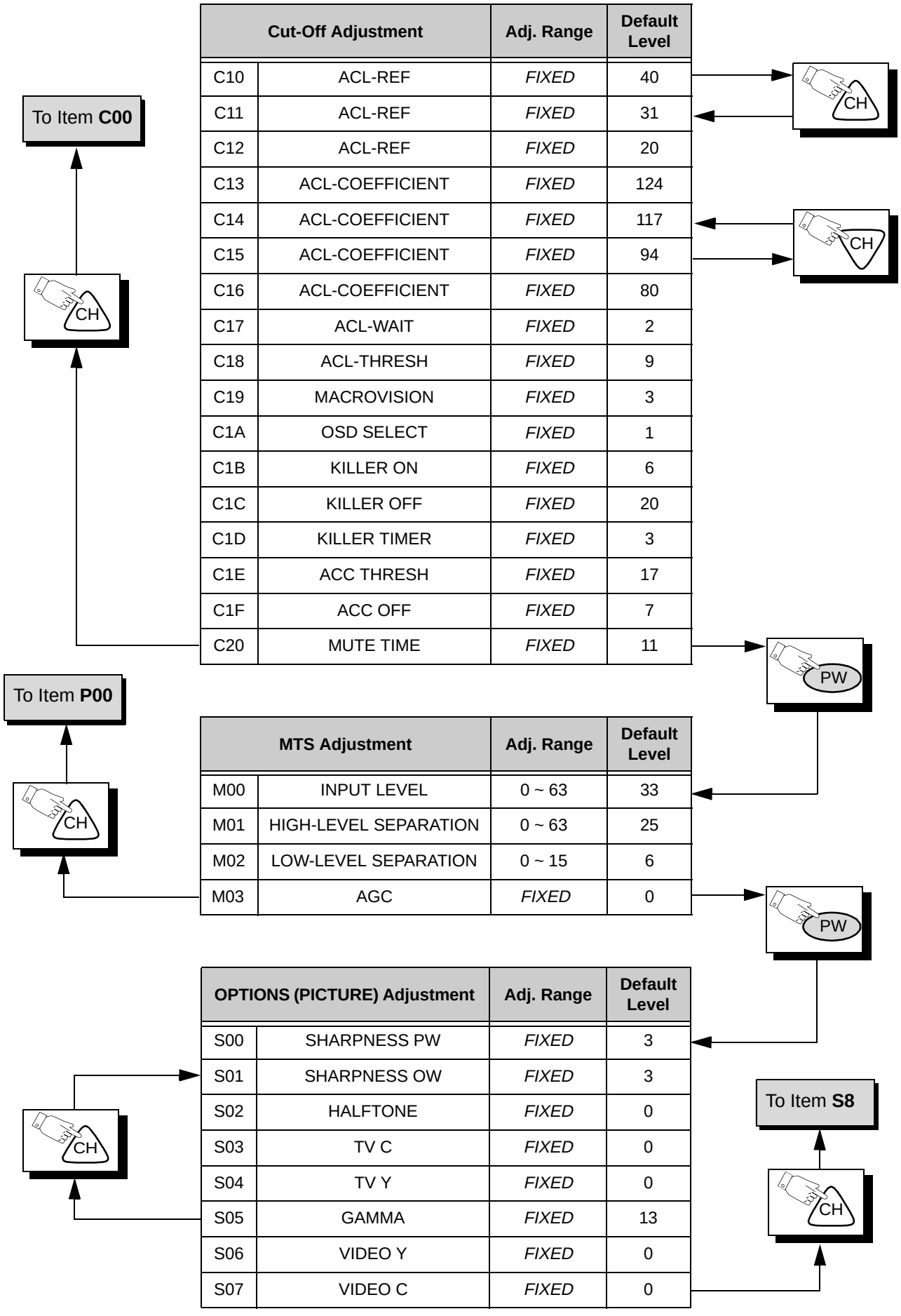
Note: *Write down the original value set (**b** in* see Fig. 20*) for each address before modifying anything. It is easy to erroneously adjust the wrong item.*

2. **Press volume Up/Down** on the **remote control** to adjust the level of the selected service adjustment (**b** in see Fig. 20).

Sub-Data Adjustment		Adj. Range	Default Level
B00	SUB-COLOR	0 ~ 127	33
B01	SUB-TINT	0 ~ 127	36
B02	SUB-BRIGHTNESS	0 ~ 255	127
B03	SUB-CONTRAST	0 ~ 127	20
B04	R-OFF SET	*FIXED*	0
B05	Y NOISE REDUCTION	*FIXED*	0
B06	Y NR LIMIT	*FIXED*	0

Cut-Off Adjustment		Adj. Range	Default Level
C00	CUT-OFF R	0 ~ 255 1 ~ 255	0 255
C01	CUT-OFF G	0 ~ 255 1 ~ 255	0 255
C02	CUT-OFF B	0 ~ 255 1 ~ 255	0 255
C03	DRIVE R	0 ~ 127	80
C04	DRIVE B	0 ~ 127	80
C05	DRIVE G	0 ~ 127	80
C06	VERTICAL SIZE	0 ~ 255	127
C07	NOT USED	N/A	N/A
C08	NOT USED	N/A	N/A
C09	HORIZONTAL CENTER	0 ~ 31	16
C0A	BEAM LIMIT	0 ~ 1	1
C0B	HHS	0 ~ 7	0
C0C	OSD-SHIFT	*FIXED*	88
C0D	ACL-REF	*FIXED*	74
C0E	ACL-REF	*FIXED*	64
C0F	ACL-REF	*FIXED*	48





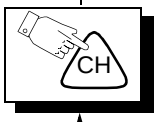
Cut-Off Adjustment		Adj. Range	Default Level
C10	ACL-REF	*FIXED*	40
C11	ACL-REF	*FIXED*	31
C12	ACL-REF	*FIXED*	20
C13	ACL-COEFFICIENT	*FIXED*	124
C14	ACL-COEFFICIENT	*FIXED*	117
C15	ACL-COEFFICIENT	*FIXED*	94
C16	ACL-COEFFICIENT	*FIXED*	80
C17	ACL-WAIT	*FIXED*	2
C18	ACL-THRESH	*FIXED*	9
C19	MACROVISION	*FIXED*	3
C1A	OSD SELECT	*FIXED*	1
C1B	KILLER ON	*FIXED*	6
C1C	KILLER OFF	*FIXED*	20
C1D	KILLER TIMER	*FIXED*	3
C1E	ACC THRESH	*FIXED*	17
C1F	ACC OFF	*FIXED*	7
C20	MUTE TIME	*FIXED*	11

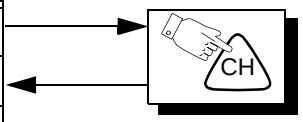
MTS Adjustment		Adj. Range	Default Level
M00	INPUT LEVEL	0 ~ 63	33
M01	HIGH-LEVEL SEPARATION	0 ~ 63	25
M02	LOW-LEVEL SEPARATION	0 ~ 15	6
M03	AGC	*FIXED*	0

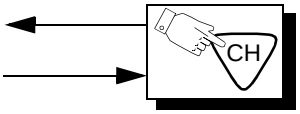
OPTIONS (PICTURE) Adjustment		Adj. Range	Default Level
S00	SHARPNESS PW	*FIXED*	3
S01	SHARPNESS OW	*FIXED*	3
S02	HALFTONE	*FIXED*	0
S03	TV C	*FIXED*	0
S04	TV Y	*FIXED*	0
S05	GAMMA	*FIXED*	13
S06	VIDEO Y	*FIXED*	0
S07	VIDEO C	*FIXED*	0

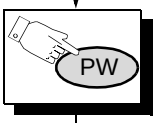
OPTIONS (PICTURE) Adjustment		Adj. Range	Default Level
S08	COMB BPF	*FIXED*	0
S09	COMB 2D	*FIXED*	1
S0A	COLOR KILLER LEVEL	*FIXED*	0
S0B	PLL KILLER TRESH	*FIXED*	0
S0C	ACC SW	*FIXED*	0
S0D	ACC AMP OFF 1	*FIXED*	100
S0E	ACC AMP OFF 2	*FIXED*	0
S0F	ACC AMP ON	*FIXED*	20
S10	ACC AMP CTL	*FIXED*	3
S11	BGP POSITION (C)	*FIXED*	21
S12	OSD R	*FIXED*	30
S13	OSD G	*FIXED*	30
S14	OSD B	*FIXED*	30
S15	NOISE KILLER TIME	*FIXED*	5
S16	NOISE KILLER	*FIXED*	50
S17	HV TIMING	*FIXED*	2

To Item **S00**

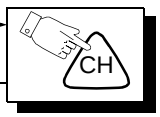


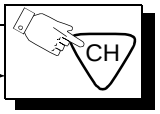




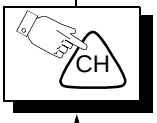


VCJ Adjustment		Adj. Range	Default Level
P00	FORCE BS	*FIXED*	1
P01	DET ON/OFF	*FIXED*	1
P02	ROM SEL	*FIXED*	3
P03	ROM CURVE	*FIXED*	2
P04	BS ON/OFF	*FIXED*	1
P05	BS TIME CONST	*FIXED*	5
P06	TH V	*FIXED*	4
P07	TH F1	*FIXED*	129
P08	TH F1	*FIXED*	1
P09	TH OFF1	*FIXED*	35
P0A	TH F2	*FIXED*	99
P0B	TH F2	*FIXED*	1
P0C	TH OFF2	*FIXED*	30
P0D	TH F3	*FIXED*	80
P0E	TH F3	*FIXED*	1
P0F	TH OFF3	*FIXED*	21

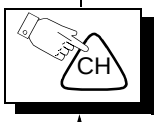




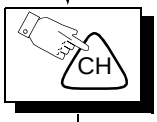
To Item **P10**



To Item **P00**



VCJ Adjustment		Adj. Range	Default Level
P10	TH ON1	*FIXED*	37
P11	TH ON2	*FIXED*	33
P12	TH ON3	*FIXED*	25
P13	CURVE1	*FIXED*	3
P14	CURVE2	*FIXED*	3
P15	CURVE3	*FIXED*	3
P16	RATIO1	*FIXED*	0
P17	RATIO2	*FIXED*	2
P18	RATIO3	*FIXED*	3



To **B** Items

IMPORTANT NOTE:
Always exit the service mode following adjustments.

Note: *Some adjustments modes may not be available in some models depending on available options.*

Check purity:

In service mode (red “CHK” is displayed), place a jumper in AG connector, press the **recall** button on the **remote control** to enter to the white purity field check, remove the jumper, press **recall** again to get to red, green and blue purity fields (if jumper is not removed for color fields, they will be displayed with higher luminosity),

In aging mode (*factory mode*, yellow “chk” is displayed), connect a jumper in ag connector, press the **recall** button on the **remote control** to enter the purity field check mode.

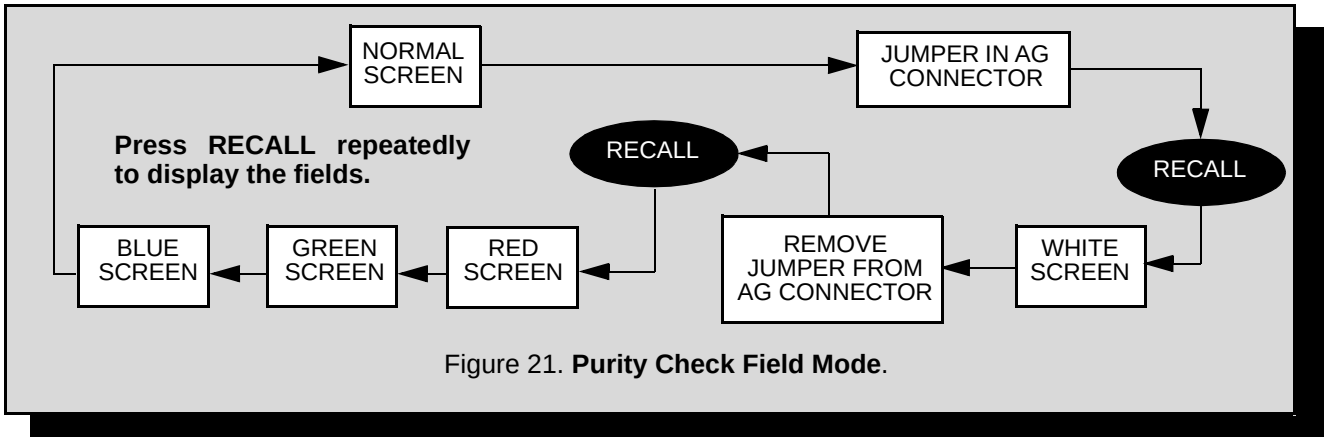


Figure 21. **Purity Check Field Mode**.

Helpful Hints

Entering service mode (back-open method, all models)

1. While the receiver is ON and operating in normal mode, momentarily short test point **FA1** (TP8) to Cold Ground (⏚) **FA2** (TP3) A-Board.
   The receiver enters the aging mode.
   Yellow letters “CHK” appear in the upper left corner of the CRT.
   (The volume Up/Down will adjust rapidly).
2. Simultaneously press the **action** and the **volume up** buttons on the **receiver** control panel.
   The receiver enters the service mode.
   The letter in “CHK” turn red.
   (The volume Up/Down will adjust normally).
   (All costumer controls are set to nominal level).

IMPORTANT NOTE:
Always exit the service mode following adjustments.

Instructional flow chart for service mode

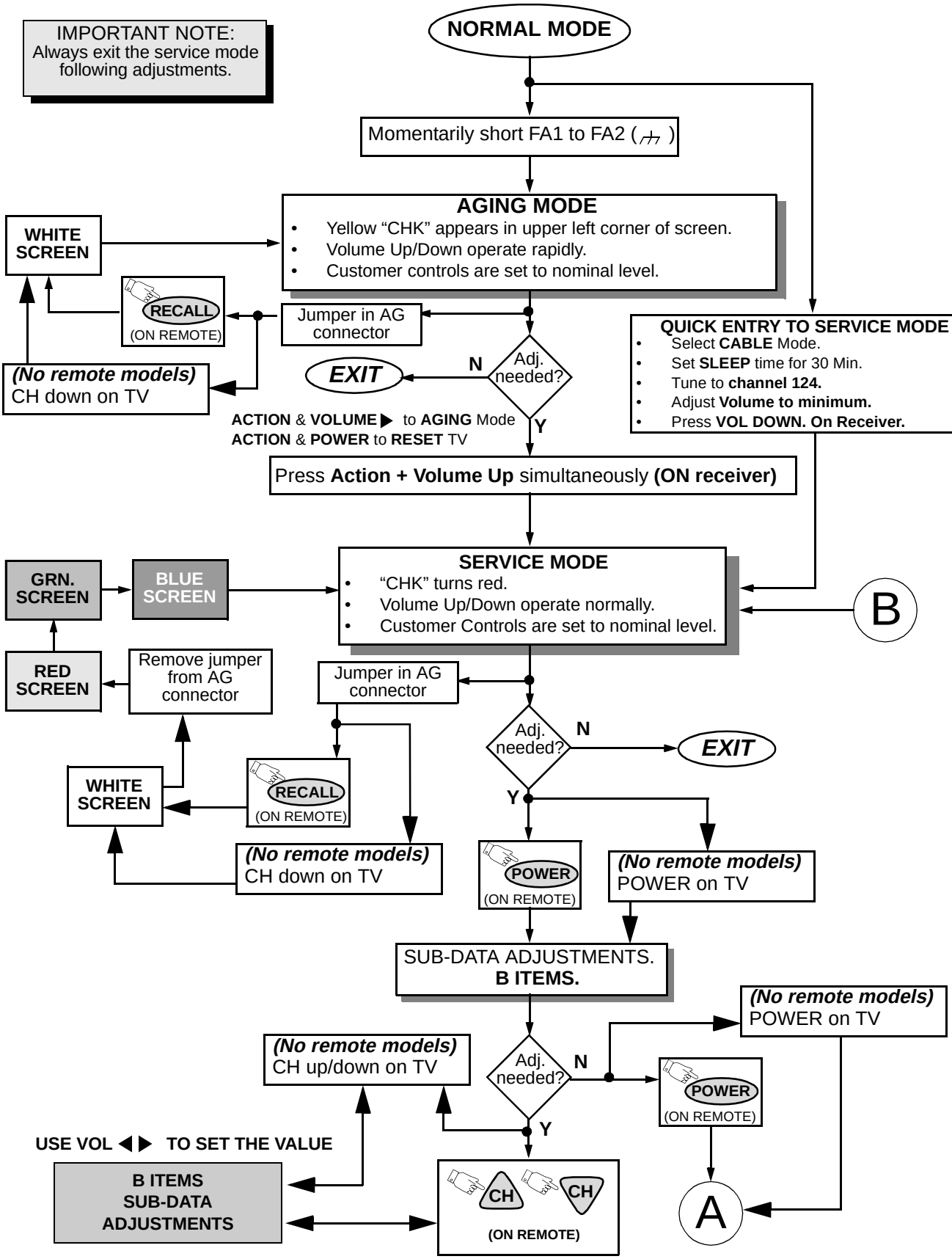


Figure 22.**Flow chart for serviceman mode**.

Instructional flow chart for serviceman mode - *(continued)*

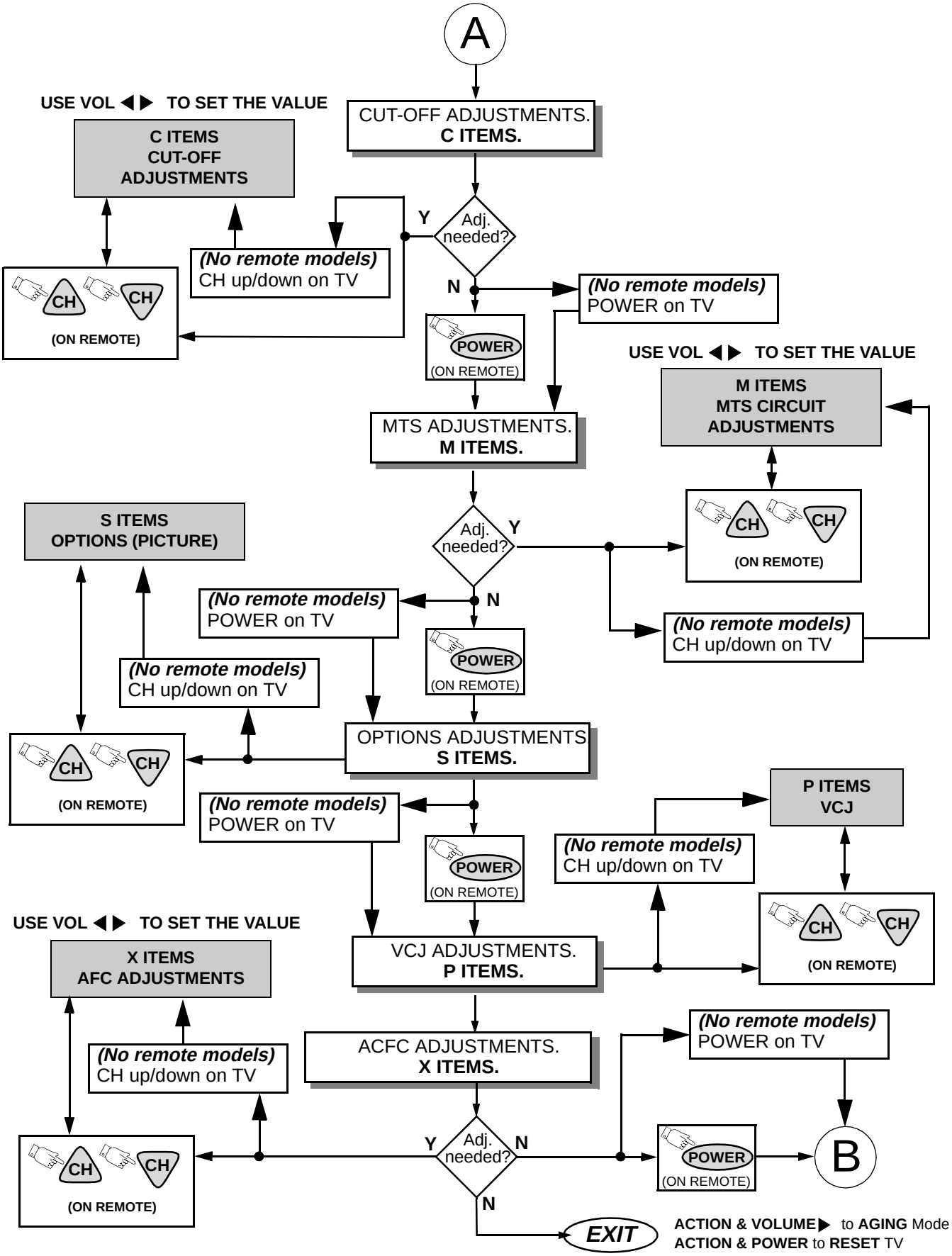


Figure 23. **Flow chart for serviceman mode - *(Continued)***

Service adjustments (electronic controls)

Note: *It is recommended to allow a 30 min. warm up at highest bright (using white screen) before perform any picture adjustment.*

Sub-Contrast

Service DAC (B03)

This adjustment is factory set. **Do not adjust** unless repairs are made to associated circuit, the CRT board or when the CRT is replaced.

Preparation:

1. Apply a color bar signal pattern with 87.5% modulation, 70% saturated color bar with a 100 IRE white and 7.5 black.

   Note: *The pattern used in this procedure is an EIA color bar pattern with 87.5% modulation with 100 IRE white and 7.5 black. Correlate the information in this procedure to the pattern used if another signal is used.*

2. Preset the following controls:
   - Brightness . . . . . .Center.
   - Picture . . . . . .Max.
   - Sharpness . . . . . .Center.
   - Gamma, *S05* 15
   - ACL OFF *C0A* 00
   - Cut Off G *C01* 00
3. Connect the scope probe between TP35 (C-Board) and cold ground (⏚).

Procedure:

1. In the service mode, select DAC Sub-Contrast adjustment (B03) and adjust to obtain **2.3Vp-p ±0.1V** for **13" models** and **2.5Vp-p ±0.1V** for **20"** and **27" models** from white level to black level on video waveform (see video waveforms detail, see Fig. 23).

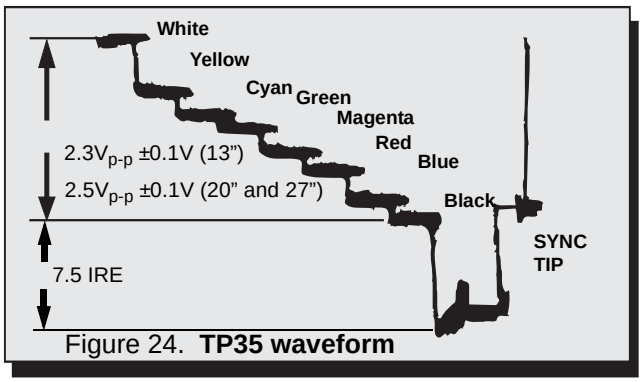


Figure 24. **TP35 waveform**

2. Following adjustments, set service registers to original values (preparation step 2).
3. Turn the set off and remove all connections from chassis.

Sub-Brightness

Service DAC (B02)

Due to the characteristics of this chassis, Sub-Brightness adjustment is no required. To obtain a good brightness level in the picture, set the service register to the default level: 127.

Perform "final Sub-brightness adjustment" only if prefer different level of brightness in the picture.

Tint/Color adjustment

Service DACs (B01) (B00)

Preparation:

1. Apply a rainbow color bar signal.
2. Preset the following controls:
   - Brightness . . . . . .Min.
   - Color . . . . . .Center.
   - Tint. . . . . .Center.
   - Picture . . . . . .Max.
   - Sharpness . . . . . .Min.
   - Gamma S05 15
   - ACL OFF C0A 00
3. Connect the oscilloscope probe between TP37 (C-Board) and cold GND (⏚).

Procedure:

1. In the service mode, select DAC B01, Sub-Tint adjustment. Adjust until the waveform measured is as below (see Fig. 24).

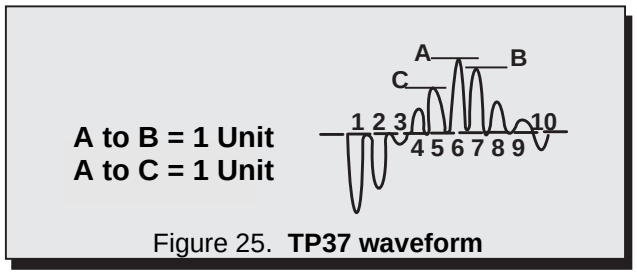


Figure 25. **TP37 waveform**

2. Connect the oscilloscope to TP35 (C-Board).
3. Select DAC sub-color adjustment (B00) and adjust for peak to peak amplitude to be **0.7Vp-p ±0.05V for 13"** and **0.8Vp-p ±0.05V for 20" and 27"** as shown in see Fig. 25.

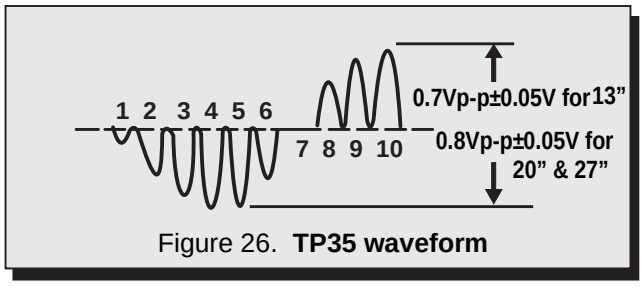


Figure 26. **TP35 waveform**

4. Following adjustments, set service registers to original values (preparation step 2).
5. Turn off the set and remove all connections from chassis.

Service adjustments (electronic controls, continued)

White balance

Service DACs (C00) (C01) (C02) (C03) (C04) (C05)

Preparation:

1. Turn the receiver "ON" and allow 30 minutes warm up at high brightness (White screen).
2. Preset the following service DACs:
   - C00. . . . . 0 255
   - C01. . . . . 0 255
   - C02. . . . . 0 255
   - C03. 80
   - C04. 80
   - C05. 80
3. Confirm with black-white pattern and a white screen the actual balance (gray scale and white level). If white balance is required perform the procedure steps as follow.

Procedure:

CUT-OFF adjustment (low lights)

1. Apply a black-white pattern.
2. Connect a jumper from Q452-Base to cold ground (⏚). (*Or apply +2.5 V D.C. to TP1 and cold ground (⏚)*) to dis-habilitate the neck protector circuit.
3. Set red Cut-Off (C00) and blue Cut-Off (C02) registers to 00.
4. Press R-Tune in the remote control (to close the vertical circuit and get green horizontal line), for models with no remote press ACTION on TV when DAC is displayed on screen.
5. Connect scope probe between GK (C-Board) and cold ground (⏚).
6. Measure waveform and adjust register G-Cut Off, C01, for the scanning period to be 195V for 27", 175V for 20" and 140V for 13", (see Fig. 26)

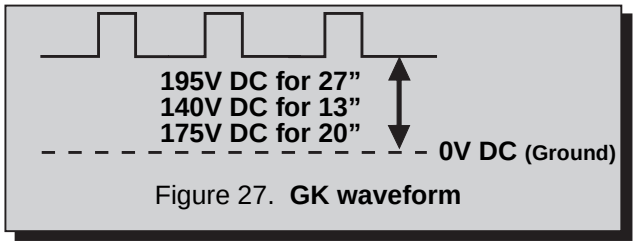


Figure 27. **GK waveform**

7. Adjust screen VR (at T551, Flyback) until the green line just becomes visible.
8. Press R-Tune in remote to open vertical, for models with no remote press ACTION on TV when DAC is displayed on screen.
9. Select red Cut-Off (C00) register, press R-Tune to see green horizontal line. Increase C00 (volume ▶) until the line just become yellow (by mixing green and red).
10. Press R-tune to open the vertical, for models with no remote press ACTION on TV when DAC is displayed on screen.
11. Select blue Cut-Off (C02) register, press R-Tune to close the vertical and see the yellow line, for models with no remote press ACTION on TV when DAC is displayed on screen. Increase C02 (volume ▶) until line just becomes white (mixing green, red and blue).
12. Press R-Tune to open the vertical, for models with no remote press ACTION on TV when DAC is displayed on screen.
13. Confirm that a good gray scale is established by viewing Black-White pattern.

White balance (high lights)

1. Using a black-white pattern and white screen, adjust red drive (C03) and blue drive (C05) to obtain correct white level on the screen.
   Observe high light areas, if white turns reddish, decrease red drive register, on the other hand, if white turns bluish, decrease blue drive register.
2. Exit service mode.
3. In "picture" menu, adjust "picture" and "bright" menu adjustments from low scale to high scale and check the black and white tracking.
4. If correction is needed repeat step 1 until obtain a correct balance.
5. After high lights adjustment is satisfactory, perform touch-up procedure as follow.

White balance touch-up procedure

(This procedure can be used as a minor adjustment procedure if required)

1. Enter service mode
2. Apply a black and white image signal (recommended with gray tones also).
3. Observe low and high brightness areas for proper tracking.
   - HIGHT LIGHT areas - Adjust red drive register (C03) and Blue drive register (C05) for warm whites.
   - LOW LIGHT areas - Adjust red cut-off register and blue cut-off register for proper black-gray

Since low level adjustment has a minor effect on high light adjustment levels than vice versa, is recommend perform this adjustment at the end.

4. Exit service mode turn off the set. Remove all connections from chassis.

Service adjustments (electronic controls, continued)

Sub-Brightness final adjustment

Service DAC (B03)

Perform this adjustment at the end. After all picture adjustments.

Preparation:

1. Turn the receiver ON and allow 20 min. warm up at high brightness (white screen).
2. Apply a black-white cross pattern
3. Preset the following controls for best results:
   - Picture . . . . . Max
   - Bright . . . . . Center

Procedure:

1. In service mode, select sub bright register B02
2. Adjust register until get the 7.5 IRE section looks the same light output than 3 Ire section, (see Fig. 27)

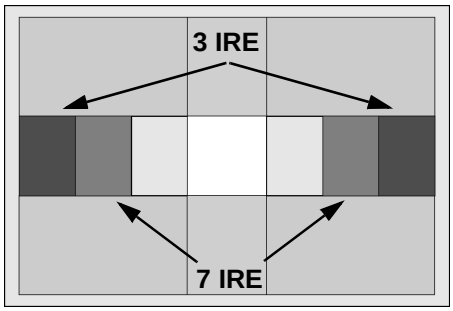


Figure 28. **Sub-bright adjustment**

3. Exit Service Mode.

Horizontal centering Service DAC (C09)

Preparation:

Connect a monoscope pattern.

Procedure:

1. In the service mode select the horizontal centering adjustment DAC (C09) and adjust until the center of the pattern is centered on CRT. Distance A should be same than B

A=B

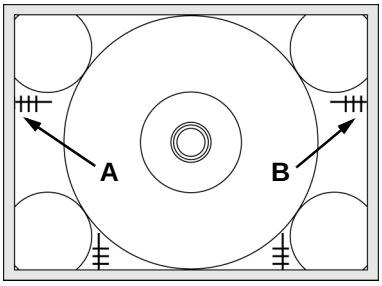


Figure 29. **Horizontal centering**

2. Exit service mode.

Vertical size

Service DAC (C06)

Preparation:

Connect a monoscope pattern.

Procedure:

1. In the service mode select vertical size adjustment DAC (C06) and adjust until obtain a perfect round picture.(Upper and lower section of the pattern may go out of the visible are)

A≃B

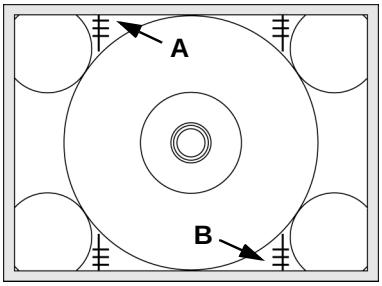


Figure 30. **Vertical size**

2. Exit the service mode.

MTS circuit adjustments (stereo models only)

The MTS Circuit adjustments require two steps:

1. Input level adjustment.
2. Stereo separation adjustment.

Input level adjustment (M00) (stereo models only)

Preparation:

1. Connect an RMS meter with filter jig as shown, (see Fig. 30).

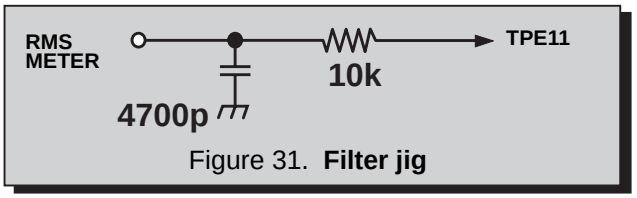


Figure 31. **Filter jig**

2. Connect an RF signal generator to the RF antenna input.

Procedure:

1. Apply the following signal from the RF signal generator:
   Video: 100 IRE flat field, 30% modulation.
   Audio: 300Hz, 100% modulation, monaural (70 ±5dB, 75Ω OPEN, P/S 10dB).
2. Adjust the MTS Input level adjustment (M00) until the voltage measured is 106 ± 6.0mV rms.

Service adjustments (electronic controls, continued)

Stereo separation adjustment (M01 & M02) (stereo models only)

Preparation:

1. Connect an RF signal generator to the RF antenna input.
2. Connect a scope between to TPE10 and cold ground (⏚).

Procedure:

1. Select stereo mode in audio menu
2. Apply the following signal from the RF signal generator:
   Video: 100 IRE flat field, 30% modulation.
   Audio: 300Hz, 100% modulation, stereo (left only) (70 ±5dB, 75Ω OPEN, P/S 10dB).
3. Adjust the MTS low-level separation adjustment (M02) until the amplitude displayed on the scope is minimum.
4. Apply the following signal from the RF signal generator:
   Video: 100 IRE flat field, 30% modulation.
   Audio: 3KHz, 100% modulation, stereo (left only) (70 ±5dB, 75Ω OPEN, P/S 10dB).
5. Adjust the MTS high-level separation adjustment (M01) until the amplitude displayed on the scope is minimum.
6. Repeat above steps 2 through 5 until the amplitude is at minimum for both signals.
7. Exit Service Mode. Turn off the set. Remove all connections from chassis.

Clock adjustment

Service DAC (X03)

Preparation:

Connect the frequency counter from TP5 (TPs port close to tuner) to cold ground(⏚).

Note: *Frequency Counter probe capacitance should be 8pF or less.*

Procedure:

1. Measure TP5 for the frequency of the waveform and record the reading.

   Note: *Measurement must have at least four digits of resolution following the decimal point. Example: 000.0000*

2. In service mode select the clock adjustment DAC (X03).
3. Calculate and set X03 based on the following formula:

$$X03 = 128 + 0.90 \times 10^{6\frac{\{TP - (125)\}}{((125))}}$$

Note: *TP5 measurement will not change regardless of the value stored in X03.*

Service adjustments (mechanical controls)

Focus (part of T551)

Preparation:

Apply a monoscope pattern.

Procedure:

1. Adjust the focus VR, trying to get the better focus as possible at the right side.
2. Confirm a correct focus at the center, then try to adjust “A” in see Fig. 31

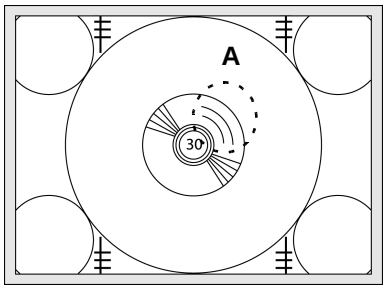


Figure 32. **Focus adjustment**

Audio signal path block diagram

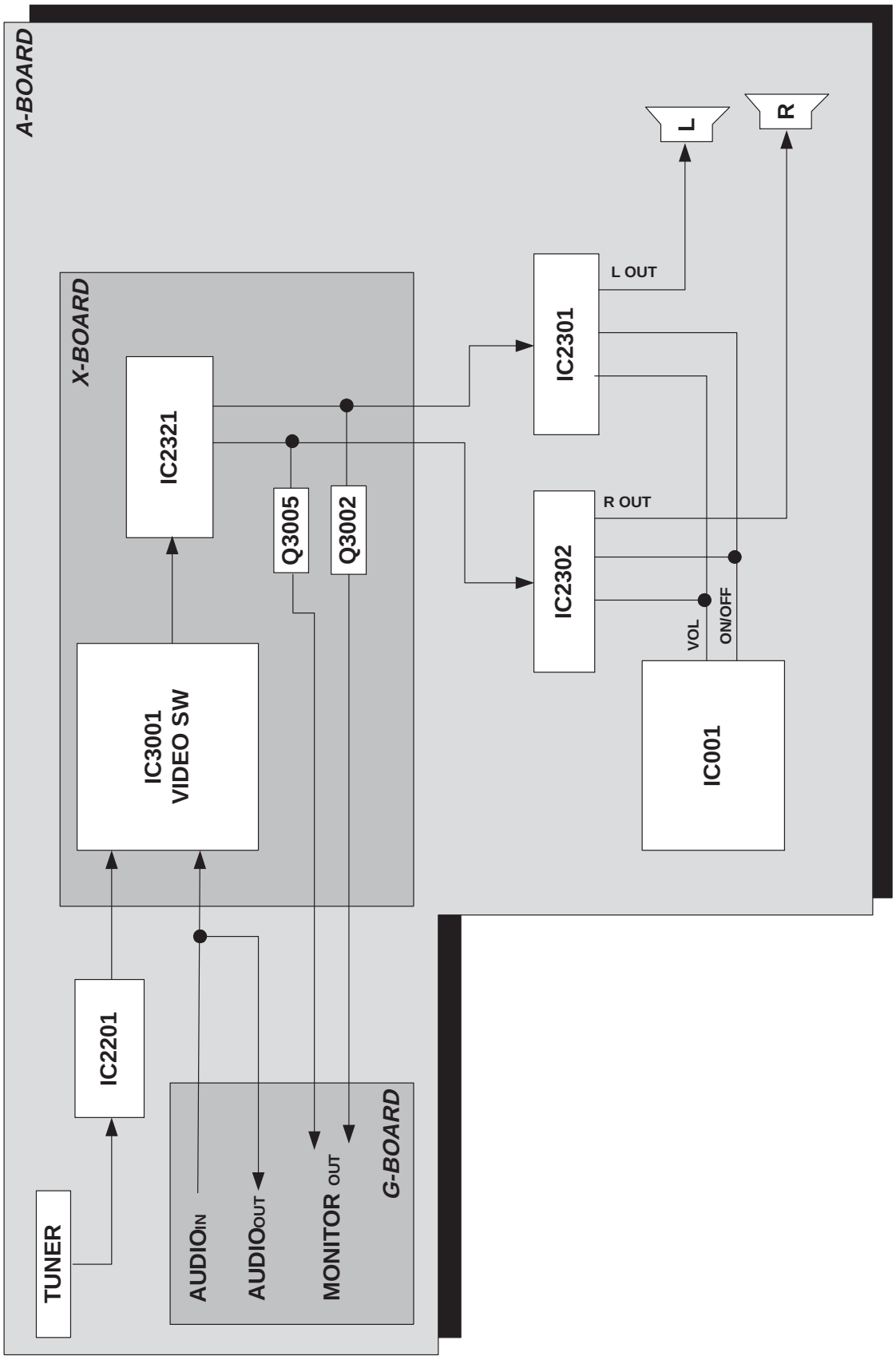


Figure 33. **Audio signal block diagram**

Video signal path block diagram

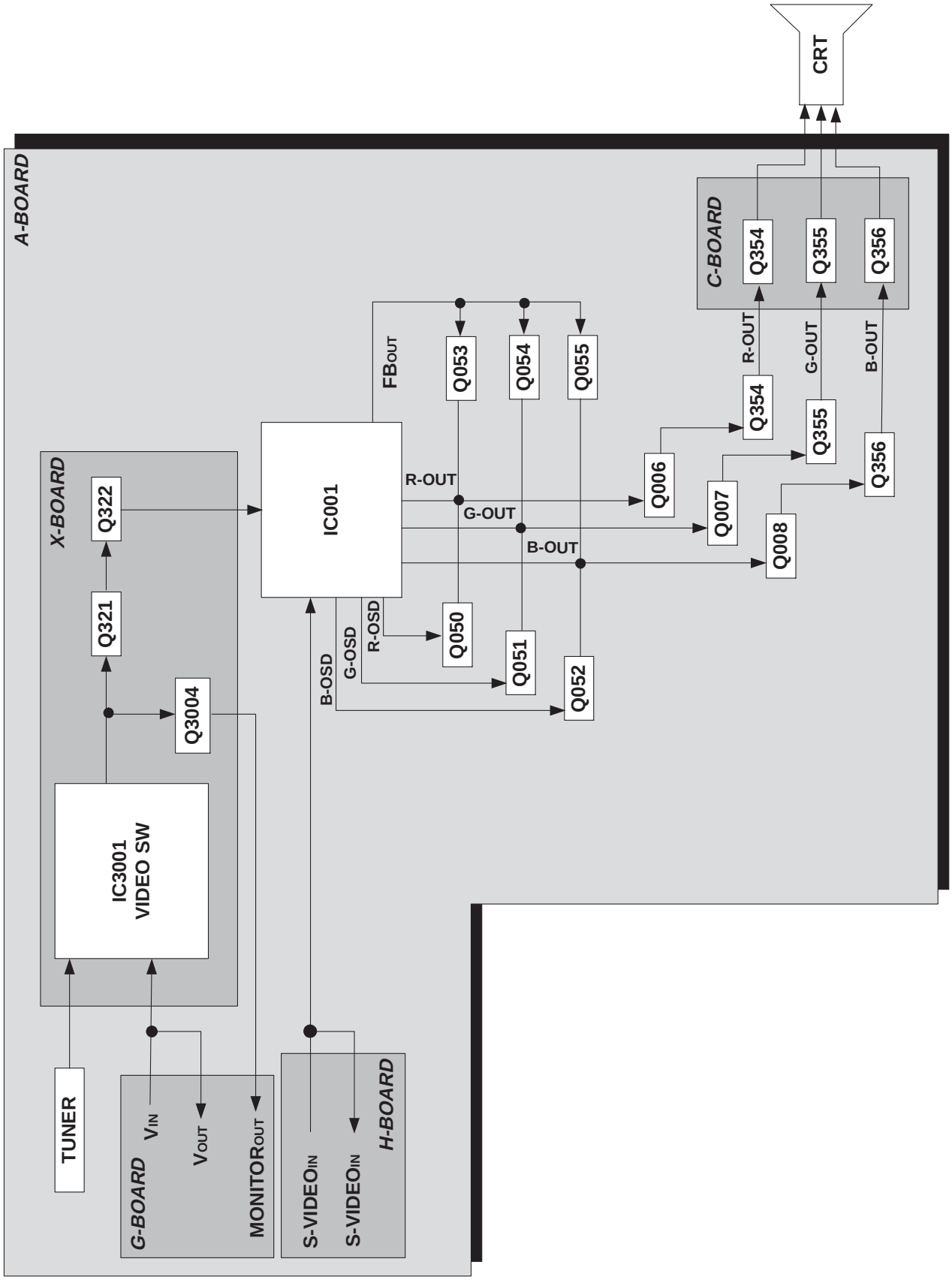


Figure 34. **Video signal block diagram**

REPLACEMENT PARTS LIST

Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
		CAPACITORS
C001	**TCJ2VF1H103Z**	**CAP,C .01UF-Z-50V**
C002	TCJ2VB1H471K	CAP,C 470PF-K-50V
C003	ECA1HM4R7B	CAP,E 4.7UF-50V *CT-1389VYD CT-2089VYD, CT-2789VYD*
C004	TCJ2VC1H150J	CAP,C 15PF-J-50V *CT-1389VYD CT-2089VYD, CT-2789VYD*
C005	TCJ2VC1H150J	CAP,C 15PF-J-50V *CT-1389VYD CT-2089VYD, CT-2789VYD*
C008	TCJ2VF1H104Z	CAP,C .1UF-Z-50V
C009	ECA1CM470B	CAP,E 47UF/16V
C010	TCJ2VF1H104Z	CAP,C .1UF-Z-50V
C011	ECA1CM101B	CAP,E 100UF/16V
C015	ECJ2VB1C224K	CAP,C .22UF-K-16V
C016	TCJ2VC1H101J	CAP,C 100PF-J-50V
C017	TCJ2VB1C104K	CAP,C .1UF-K-16V
C018	TCJ2VC1H151J	CAP,C 150PF-J-50V
C022	TCJ2VC1H101J	CAP,C 100PF-J-50V
C023	TCJ2VC1H151J	CAP,C 150PF-J-50V
C024	ECA1CM470B	CAP,E 47UF/16V
C025	TCJ2VB1C104K	CAP,C .1UF-K-16V
C026	TCJ2VB1C104K	CAP,C .1UF-K-16V
C027	TCJ2VF1H104Z	CAP,C .1UF-Z-50V
C028	TCJ2VB1C104K	CAP,C .1UF-K-16V
C029	ECQB1H333JM3	CAP,P .033UF-J-50V
C031	ECA1HMR22B	CAP,E .22UF-50V
C032	ECA1VM470B	CAP,E 47UF/35V *CT-1389VYD CT-2089VYD, CT-2789VYD*
C033	TCJ2VC1H390J	CAP,C 39PF-J-50V
C034	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C035	ECA1HM010B	CAP,E 1UF-50V
C036	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C037	ECA1HM0R1B	CAP,E 0.1UF/50V
C038	ECA1VM470B	CAP,E 47UF/35V *CT-1389VYD CT-2089VYD, CT-2789VYD*
C040	ECA1CM470B	CAP,E 47UF/16V *CT-1389VYD CT-2089VYD, CT-2789VYD*
C041	ECA1HM2R2B	CAP,E 2.2UF-50V *CT-1389VYD CT-2089VYD, CT-2789VYD*
C042	TCJ2VF1H104Z	CAP,C .1UF-Z-50V
C043	ECA1CM470B	CAP,E 47UF/16V
C044	TCJ2VC1H471J	CAP,C 470PF-J-50V
C045	ECA1HM0R1B	CAP,E 0.1UF/50V
C046	TCJ2VB1C104K	CAP,C .1UF-K-16V
C047	TCJ2VC1H220J	CAP,C 22PF-J-50V
C048	TCJ2VC1H220J	CAP,C 22PF-J-50V
C050	ECA1CM101B	CAP,E 100UF/16V
C051	TCJ2VF1H104Z	CAP,C .1UF-Z-50V
C055	TCJ2VC1H560J	CAP,C 56PF-J-50V *CT-1389VYD CT-2089VYD, CT-2789VYD*
C103	ECA0JM331B	CAP,E 330UF-6.3V
C104	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C105	ECA0JM101B	CAP,E 100UF-6.3V
C201	TCJ2VB1H332K	CAP,C .0033UF-K-50V
		CT-1389VYD CT-2089VYD
C350	ECA1CM101B	CAP,E 100UF/16V
C351	TCJ2VB1H391K	CAP,C 390PF-K-50V *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
C351	TCJ2VB1H471K	CAP,C 470PF-K-50V *CT-1388YD, CT-1389VYD*
C352	TCJ2VB1H391K	CAP,C 390PF-K-50V
C353	TCJ2VB1H471K	CAP,C 470PF-K-50V
C354	ECKW3D102KBN	CAP,C .001UF-K-2KVDC
C357	EEANA1E1R0B	CAP,E 1.0UF-25V
C361	TCJ2VC1H151J	CAP,C 150PF-J-50V
C362	TCJ2VC1H151J	CAP,C 150PF-J-50V
C363	TCJ2VC1H151J	CAP,C 150PF-J-50V
C451	ECA1CHG470B	CAP,E 47UF-16V
C452	ECSF1EE105VB	CAP,E 1.0UF-25V
C453	ECEA1HFS010B	CAP,E 1UF-50V *CT-2877YD, CT-2879VYD*
C453	ECEA1HFS2R2B	CAP,E 2.2UF-50V *CT-2088YD, CT-2089VYD*
C453	ECEA1HFS3R3B	CAP,E 3.3UF-50V *CT-1388YD, CT-1389VYD*
C454	ECA1EM102E	CAP,E 1000UF-25V
C455	ECA1EHG101B	CAP,E 100UF-25V *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
C455	ECA1VHG101B	CAP,E 100UF-35V *CT-2788YD, CT-2789VYD*
C456	ECQB1H103JM3	CAP,P .01UF-J-50V
C459	ECA1VHG471E	CAP,E 470UF-35V
C462	ECA1HM4R7B	CAP,E 4.7UF-50V
C502	TCJ2VC1H471J	CAP,C 470PF-J-50V
C503	TCJ2VB1C104K	CAP,C .1UF-K-16V
C504	TCJ2VB1C104K	CAP,C .1UF-K-16V
C510	ECCR2H100D5	CAP,C 10PF-D-500V
C511	ECKR2H821KB5	CAP,C 820PF-K-500V
C512	ECKR2H101KB5	CAP,C 100UF-K-500V
C531	**ECA1HM220B**	**CAP,E 22UF-50V**
C551	**ECA1VM331B**	**CAP,E 330UF-35V**
C554	ECKR2H561KB5	CAP,C 560PF-K-500V
C555	**ECA2EM220E**	**CAP,E 22UF-250V**
C556	**ECA1CM471B**	**CAP,E 470UF-16V**
C557	ECKR2H102KB5	CAP,C 1000PF-K-500V *CT-2788YD, CT-2789VYD*
C557	ECKR2H222KB5	CAP,C 2200PF-K-500V *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
C559	ECA1HM220B	CAP,E 22UF-50V *CT-1388YD, CT-1389VYD*
C560	ECEA1HN010UB	CAP,E 1UF/50V
C561	ECKR2H561KB5	CAP,C 560PF-K-500V

REPLACEMENT PARTS LIST

Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
C563	**ECWH12H362JS**	**CAP,P ,0036UF-J-1,2KV** ***CT-2088YD, CT-2089VYD***
C563	**ECWH12H752JS**	**CAP,P .0075UF-J-1.2KV** ***CT-1388YD, CT-1389VYD***
C563	**ECWH12H822JS**	**CAP,P .0082UF-J-1.2KV** ***CT-2788YD, CT-2789VYD***
C564	**ECWH12H472JS**	**CAP,P .0047UF-J-1.2KV** ***CT-2088YD, CT-2089VYD***
C564	**ECWH12H562JS**	**CAP,P .0056UF-J-1.2KV** ***CT-2788YD, CT-2789VYD***
C565	**ECKW3D181JBP**	**CAP,C 180PF-J-2KV** ***CT-2788YD, CT-2789VYD***
C565	**ECKW3D681JBR**	**CAP,C 680PF-J-2KV** ***CT-1388YD, CT-1389VYD***
C565	**ECKW3D821JBR**	**CAP,C 820PF-J-2KV** ***CT-2088YD, CT-2089VYD***
C566	**ECKW3D181JBP**	**CAP,C 180PF-J-2KV**
C568	**ECQM4473JZW**	**CAP,P .047UF-J-400V** ***CT-2088YD, CT-2089VYD***
C568	**ECWF2274JBB**	**CAP,M .27UF-J-200V** ***CT-2788YD, CT-2789VYD***
C569	**ECWF2304JBB**	**CAP,M .3UF-J-200V** ***CT-1388YD, CT-1389VYD***
C569	**ECWF2394JBB**	**CAP,P .39UF-J-200V** ***CT-2088YD, CT-2089VYD***
C569	**ECWF2474JBB**	**CAP,M .47UF-J-200V** ***CT-2788YD, CT-2789VYD***
C570	ECA1CM222E	CAP,E 2200UF-16V
C571	ECA1HM220B	CAP,E 22UF-50V
C572	ECA1HM100B	CAP,E 10UF/50V
C573	ECA1CM101B	CAP,E 100UF/16V
C575	ECA0JM222B	CAP,E 2200UF-6.3V
C577	ECA1CM101B	CAP,E 100UF/16V
C578	ECA0JM332B	CAP,E 3300PF-6.3V
C579	TCJ2VC1H100D	CAP,C 10PF-D-50V
C605	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C606	ECA0JM221B	CAP,E 220UF-6.3V
C801	**ECKWAE472ZED**	**CAP,C 4700PF-Z-500V**
C802	**ECKWAE472ZED**	**CAP,C 4700PF-Z-500V**
C803	**ECKWAE472ZED**	**CAP,C 4700PF-Z-500V**
C805	**EC0S2DA221BB**	**CAP,E 220UF/200V** ***CT-2088YD, CT-2089VYD***
C805	**EC0S2DA331BB**	**CAP,E 330UF/200V** ***CT-2788YD, CT-2789VYD***
C805	**EC0S2DG151DG**	**CAP,E 151UF/200V** ***CT-1388YD, CT-1389VYD***
C806	ECQM4103KZW	CAP,P .01UF-K-400V
C807	ECKR3A821KBP	CAP,C 820PF-K-1KV
C808	ECA1VM101B	CAP,E 100UF-35V
C809	ECKR1H101KB5	CAP,C 100PF-K-50V
C810	ECKR1H471KB5	CAP,C 470PF-K-50V
C812	**ECQU2A224MVA**	**CAP,P .22UF-M-250VAC**
C813	**ECQU2A153MVA**	**CAP,P .015UF-M-250VAC**
C814	**ECQU2A153MVA**	**CAP,P .015UF-M-250VAC**

REF NO.	PART NO.	DESCRIPTION
C820	ECA1CM101B	CAP,E 100UF/16V
C821	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C822	ECKR3A221KBP	CAP,C 220PF-K-1KV
C823	**ECA1HM471B**	**CAP,E 470UF-50V**
C824	ECKR3A471KBP	CAP,C 470PF-K-1KV
C825	**EEUMG2C221S**	**CAP,E 220UF-160V**
C826	ECKR3A471KBP	CAP,C 470PF-K-1KV
C827	ECA1CM221B	CAP,E 10UF-16V
C828	**ECA160V33UE**	**CAP,E 33UF/160V**
C2201	ECA1HM4R7B	CAP,E 4.7UF-50V *CT-2789VYD*
C2202	ECA1HM2R2B	CAP,E 2.2UF-50V *CT-2789VYD*
C2203	ECA1HM4R7B	CAP,E 4.7UF-50V *CT-2789VYD*
C2204	AP106K016CAE	CAP,T 10UF/16V *CT-2789VYD*
C2205	ECA1HMR33B	CAP,E .33UF-50V *CT-2789VYD*
C2206	ECQB1H223JM3	CAP,P .022UF-J-50V *CT-2789VYD*
C2207	AP335K016CAE	CAP,T 3.3UF/16V *CT-2789VYD*
C2208	TCJ2VB1C104K	CAP,C .1UF-K-16V *CT-2789VYD*
C2209	TCJ2VB1C104K	CAP,C .1UF-K-16V *CT-2789VYD*
C2210	TCJ2VB1C104K	CAP,C .1UF-K-16V *CT-2789VYD*
C2212	ECQB1H473JM3	CAP,P .047UF-J-50V *CT-2789VYD*
C2213	ECA1HMR47B	CAP,E .47UF-50V *CT-2789VYD*
C2214	ECA1CM101B	CAP,E 100UF/16V *CT-2789VYD*
C2215	EEANA1E100B	CAP,E 10UF-25V *CT-2789VYD*
C2216	TCJ2VC1H100D	CAP,C 10PF-J-50V *CT-2789VYD*
C2301	ECA1VM102E	CAP,E 1000UF-35V *CT-2788YD, CT-2789VYD*
C2302	ECEA1HN010UB	CAP,E 1UF/50V *CT-2788YD, CT-2789VYD*
C2303	ECA1EM101B	CAP,E 100UF-25V *CT-2788YD, CT-2789VYD*
C2304	ECA1EM100B	CAP,E 10UF-25V *CT-2788YD, CT-2789VYD*
C2307	ECA1CM102B	CAP,E 1000UF/16V *CT-2788YD, CT-2789VYD*
C2311	ECA1VM102E	CAP,E 1000UF-35V
C2312	ECEA1HN010UB	CAP,E 1UF/50V
C2313	ECA1EM101B	CAP,E 100UF-25V
C2314	ECA1CM100B	CAP,E 10UF-16V
C2317	ECA1CM102B	CAP,E 1000UF/16V
C2320	ECA1CM100B	CAP,E 10UF-16V *CT-2788YD, CT-2789VYD*
C2330	ECA1CM100B	CAP,E 10UF-16V
C2333	ECA1HM0R1B	CAP,E 0.1UF/50V *CT-2788YD, CT-2789VYD*
C2334	TCJ2VB1H472K	CAP,C 4700PF-K-50V *CT-2788YD, CT-2789VYD*
C2335	ECA1CM470B	CAP,E 47UF/16V *CT-2788YD, CT-2789VYD*
C2336	ECQB1H104JM3	CAP,P .1UF-J-50V *CT-2788YD,CT-2789VYD*
C2337	ECA1HM0R1B	CAP,E 0.1UF/50V *CT-2788YD, CT-2789VYD*
C2338	ECA1HM4R7B	CAP,E 4.7UF-50V *CT-2788YD, CT-2789VYD*

REPLACEMENT PARTS LIST

Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

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REF NO.	PART NO.	DESCRIPTION
C2339	ECA1EM100B	CAP,E 10UF-25V *CT-2788YD, CT-2789VYD*
C2340	ECA1HMR47B	CAP,E .47UF-50V *CT-2788YD, CT-2789VYD*
C2341	ECA1HM4R7B	CAP,E 4.7UF-50V *CT-2788YD, CT-2789VYD*
C2342	ECA1HM4R7B	CAP,E 4.7UF-50V *CT-2788YD, CT-2789VYD*
C2343	ECA1HM4R7B	CAP,E 4.7UF-50V *CT-2788YD ,CT-2789VYD*
C2344	TCJ2VB1H472K	CAP,C 4700PF-K-50V *CT-2788YD, CT-2789VYD*
C2345	ECA1HM0R1B	CAP,E 0.1UF/50V *CT-2788YD, CT-2789VYD*
C2346	ECA1CM470B	CAP,E 47UF/16V *CT-2788YD, CT-2789VYD*
C2347	TCUV1H103KBN	CAP,C .01UF-K-50V *CT-2788YD, CT-2789VYD*
C2350	ECA1HM4R7B	CAP,E 4.7UF-50V
C3001	ECEA1HKN0R1B	CAP,E .1UF-50V
C3005	TCJ2VF1H103Z	CAP,C .01UF-Z-50V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
C3007	ECA1CM100B	CAP,E 10UF-16V *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
C3008	ECA1HM010B	CAP,E 1UF-50V *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
C3009	ECA1HM010B	CAP,E 1UF-50V *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
C3010	ECA1HM010B	CAP,E 1UF-50V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
C3014	ECEA1HN010UB	CAP,E 1UF/50V *CT-2789VYD*
C3016	ECA1CM470B	CAP,E 47UF/16V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
C3020	ECA1CM471B	CAP,E 470UF-16V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
C3021	ECA1HM010B	CAP,E 1UF-50V *CT-2789VYD*
C3021	ECEA1HU010E	CAP,E 1UF/50V *CT-1389VYD, CT-2089VYD*
C3022	ECA1CM101B	CAP,E 100UF/16V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
C3023	ECA1HM010B	CAP,E 1UF-50V *CT-2789VYD*
C3024	ECEA1HN010UB	CAP,E 1UF/50V *CT-2789VYD*
C3025	ECEA1CN470UE	CAP,E 47UF-16V *CT-1389VYD CT-2089VYD, CT-2789VYD*
C3026	ECA1CM100B	CAP,E 10UF-16V
C3027	TCJ2VF1H103Z	CAP,C .01UF-Z-50V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*

REF NO.	PART NO.	DESCRIPTION
C3028	ECA1CM100B	CAP,E 10UF-16V CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD
C3030	ECA1CM100B	CAP,E 10UF-16V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
C3031	ECA1CM100B	CAP,E 10UF-16V *CT-2789VYD*
C3032	ECEA1HN010UB	CAP,E 1UF/50V *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
C3040	ECEA1CN100UB	CAP,E 10UF-16V *CT-2788YD, CT-2789VYD*
C3041	ECEA1CN100UB	CAP,E 10UF-16V *CT-2788YD, CT-2789VYD*
C3042	ECA1CM470B	CAP,E 47UF/16V *CT-2789VYD*
C3043	ECEA1HN010UB	CAP,E 1UF/50V *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
C3050	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
C3051	TCJ2VF1H103Z	CAP,C .01UF-Z-50V
		DIODES
D002	MA165TA5VT	DIODE, SWITCHING
D006	MA4330HTA	DIODE *CT-1389VYD CT-2089VYD, CT-2789VYD*
D052	MA4068MTA	DIODE, ZENER
D053	MA4056MTA	DIODE
D055	MA4056MTA	DIODE
D451	ERA15-01V3	DIODE, RECTIFIER
D452	MA4047MTA	DIODE
D453	MA165TA5VT	DIODE, SWITCHING
D454	MA165TA5VT	DIODE, SWITCHING
D456	MA4047MTA	DIODE *CT-2088YD, CT-2089VYD*
D502	MA4047MTA	DIODE
D531	**AS01V0**	**DIODE**
D551	**D1NL20UV70**	**DIODE**
D554	**AU02V0**	**DIODE**
D558	RS3FS	DIODE *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
D559	BYD33G-113	DIODE *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
D561	**AU02V0**	**DIODE**
D571	MA165TA5VT	DIODE, SWITCHING
D606	MA165TA5VT	DIODE, SWITCHING
D607	MA152KTX	DIODE
D608	MA152KTX	DIODE
D609	MA152KTX	DIODE
D801	**D3SBA60-4103**	**DIODE**
D806	**TAP2AA0001**	**DIODE (THERMISTOR)** ***CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD***
D806	**TAP4GA0006**	**DIODE (THERMISTOR)** ***CT-2788YD, CT-2789VYD***
D808	SARS01V1	DIODE

REPLACEMENT PARTS LIST

Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

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REF NO.	PART NO.	DESCRIPTION
D809	AG01V0	DIODE
D810	AG01V0	DIODE
D811	AG01V0	DIODE
D812	**MA4068MTA**	**DIODE, ZENER**
D820	MA165TA5VT	DIODE, SWITCHING
D821	MA4047HTA	DIODE
D822	RN1ZLF-B1	DIODE
D823	**S3L60P154004**	**DIODE**
D824	D1NL20UV70	DIODE
D2350	MA4068MTA	DIODE, ZENER
D2351	MA165TA5VT	DIODE, SWITCHING
D2352	MA165TA5VT	DIODE, SWITCHING
D2353	MA165TA5VT	DIODE, SWITCHING
D2354	MA4091MTA	DIODE
D3001	MA3110MTX	DIODE, ZENER
D3082	MA4110MTA	DIODE, ZENER *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
D3083	MA4110MTA	DIODE, ZENER *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
D3084	MA4110MTA	DIODE, ZENER
D3085	MA4110MTA	DIODE, ZENER
D3086	MA4110MTA	DIODE, ZENER
D3087	MA4110MTA	DIODE, ZENER
D3088	MA4110MTA	DIODE, ZENER *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
D3089	MA4110MTA	DIODE, ZENER *CT-1388YD CT-1389VYD ,CT-2088YD CT-2089VYD, CT-2789VYD*
D3090	MA4110MTA	DIODE, ZENER
D3091	MA4110MTA	DIODE, ZENER
D3092	MA4110MTA	DIODE, ZENER *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
D3093	MA4110MTA	DIODE, ZENER *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
D3094	MA4110MTA	DIODE, ZENER *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
D3095	MA4110MTA	DIODE, ZENER *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
D3096	MA4110MTA	DIODE, ZENER *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
D3097	MA4110MTA	DIODE, ZENER *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
D3098	MA4110MTA	DIODE, ZENER *CT-2789VYD*
D3099	MA4110MTA	DIODE, ZENER *CT-2789VYD*
D3200	MA4120TA	DIODE, ZENER
D3201	MA4120TA	DIODE, ZENER *CT-1388YD ,CT-1389VYD CT-2088YD, CT-2089VYD*
D3202	MA4120TA	DIODE, ZENER *CT-1388YD ,CT-1389VYD CT-2088YD ,CT-2089VYD*
D3203	MA3110MTX	DIODE, ZENER
D3204	MA3110MTX	DIODE, ZENER
D3206	MA3110MTX	DIODE, ZENER *CT-1388YD CT-1389VYD ,CT-2088YD CT-2089VYD, CT-2789VYD*
D3208	MA3110MTX	DIODE, ZENER *CT-1388YD CT-1389VYD ,CT-2088YD CT-2089VYD, CT-2789VYD*
		FUSES
F801	**XBA2A00101**	**FUSE 6.3A 125V**
		INTEGRATED CIRCUITS
IC001	**M65580MAPB00**	**MPU**
IC002	C3EAEC000016	EEPROM
IC003	PIC-37042SR	IR REMOTE SENSOR *CT-1389VYD CT-2089VYD, CT-2789VYD*
IC005	PQ1R33	3.3V REGULATOR
IC006	MN1280R	RESET
IC050	TC74HC4066AL	HALFTONE
IC451	**LA7837-TV**	**VERTICAL OUT *CT-1388YD, CT-1389VYD CT-2088YD,CT-2089VYD***
IC451	**LA7838**	**VERTICAL OUT *CT-2788YD, CT-2789VYD***
IC551	AN78L09	9V REGULATOR *CT-1388YD CT-2088YD, CT-2788YD*
IC551	AN78M09LB	9V REGULATOR *CT-1389VYD CT-2089VYD, CT-2789VYD*
IC552	**AN78M05LB**	**PLUS 5V AVR**
IC553	**AN78M05LB**	**PLUS 5V AVR**
IC801	**STRG5623**	**MAIN REGULATOR *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD***
IC801	**STRG5624**	**MAIN REGULATOR *CT-2788YD, CT-2789VYD***
IC2201	AN5829S-E1V	MTS, S-AGC *CT-2789VYD*
IC2301	AN17802A	AUDIO AMPLIFIER *CT-2788YD, CT-2789VYD*
IC2302	AN17800A	AUDIO AMPLIFIER *CT-1388YD ,CT-1389VYD CT-2088YD, CT-2089VYD*
IC2302	AN17802A	AUDIO AMPLIFIER *CT-2788YD, CT-2789VYD*
IC2321	CXA2021S	AUDIO CONTROL *CT-2788YD, CT-2789VYD*
IC3001	M52472P	A/V SWITCH *CT-1388YD CT-1389VYD ,CT-2088YD CT-2089VYD, CT-2789VYD*
		COILS
J325	EXCELSA35V	FERRITE BEAD

REPLACEMENT PARTS LIST

Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
LC005	EXCEMT332DT	EMI FILTER *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
LC007	EXCEMT332DT	EMI FILTER *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
LC013	EXCEMT332DT	EMI FILTER *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
LC018	EXCEMT332DT	EMI FILTER *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
L001	EXCELSA35T	FERRITE BEAD *CT-1388YD CT-2088YD, CT-2089VYD CT-2788YD ,CT-2789VYD*
L003	TLUABTA2R2K	COIL, PEAKING 2.2UH
L004	TLUABTA2R2K	COIL, PEAKING 2.2UH
L005	EXCELDR35V	FERRITE BEAD *CT-1388YD, CT-1389VYD*
L006	EXCELSA24T	FERRITE BEAD
L007	EXCELDR35V	FERRITE BEAD *CT-1388YD, CT-1389VYD*
L008	TLUABTA470K	COIL, PEAKING 47UH *CT-1389VYD CT-2089VYD, CT-2789VYD*
L009	EXCELSA35V	FERRITE BEAD *CT-1389VYD CT-2089VYD, CT-2789VYD*
L010	ELESN330JA	COIL, PEAKING 33UH *CT-1389VYD CT-2089VYD, CT-2789VYD*
L011	ELESN330JA	COIL, PEAKING 33UH *CT-1389VYD CT-2089VYD, CT-2789VYD*
L013	EXCELDR35V	FERRITE BEAD *CT-1388YD CT-1389VYD*
L014	ELESN180KA	COIL, PEAKING 18UH *CT-1389VYD CT-2089VYD, CT-2789VYD*
L015	EXCELSA35V	FERRITE BEAD
L016	EXCELSA35V	FERRITE BEAD
L017	TLUABTA100K	COIL, PEAKING 10UH
L018	TLUABTA150K	COIL, PEAKING 15UH
L019	EXCELDR25V	FERRITE BEAD *CT-1388YD*
L019	EXCELDR35V	FERRITE BEAD *CT-1389VYD*
L090	EXCELSA24T	FERRITE BEAD
L102	EXCELDR35V	FERRITE BEAD *CT-1388YD, CT-2088YD*
L104	TLUABTA2R2K	COIL, PEAKING 2.2UH
L108	EXCELSA35V	FERRITE BEAD
L211	EXCELSA35V	FERRITE BEAD *CT-1388YD, CT-1389VYD*
L245	EXCELSA35V	FERRITE BEAD
L250	EXCELSA35V	FERRITE BEAD *CT-1389VYD CT-2089VYD, CT-2789VYD*
L306	TLUABTA2R2K	COIL, PEAKING 2.2UH
L325	EXCELSA35V	FERRITE BEAD
L351	TLTABT101K	LINE FILTER *CT-2788YD, CT-2789VYD*
L351	TLTABT470K	COIL, PEAKING 47UH *CT-1388YD, CT-1389VYD*
L403	TLUABTA2R2K	COIL, PEAKING 2.2UH
L416	EXCELSA39V	FERRITE BEAD
L551	**ELH5L4101**	**COIL *CT-2088YD, CT-2089VYD***
L551	**ELH5L4136**	**COIL *CT-1388YD, CT-1389VYD***
L551	**ELH5L7103**	**COIL *CT-2788YD, CT-2789VYD***
L552	EXCELSA24T	FERRITE BEAD *CT-1388YD, CT-1389VYD*
L553	EXCELSA24T	FERRITE BEAD *CT-1388YD, CT-1389VYD*
L801	**ELF15N011A**	**LINE FILTER *CT-2088YD, CT-2089VYD***
L801	**ELF15N013A**	**LINE FILTER *CT-1388YD, CT-1389VYD***
L801	**ELF20N020A**	**COIL, 2UH *CT-2788YD, CT-2789VYD***
L802	ELEIN470KA	COIL, PEAKING *CT-2788YD, CT-2789VYD*
L802	ELEIN680KA	COIL, PEAKING 68UH *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
L803	TALL08T680KA	LINE FILTER
L805	ELEIE220KA	COIL 22UH
L2305	EXCELSA35V	FERRITE BEAD
L2350	ELESN4R7JA	COIL, PEAKING 4.7UH
		TRANSISTORS
Q001	2SD601ARTX	TRANSISTOR
Q006	2SB709ARTX	TRANSISTOR
Q007	2SB709ARTX	TRANSISTOR
Q008	2SB709ARTX	TRANSISTOR
Q009	2SC1473A	TRANSISTOR
Q050	2SB709ARTX	TRANSISTOR
Q051	2SB709ARTX	TRANSISTOR
Q052	2SB709ARTX	TRANSISTOR
Q053	2SD601ARTX	TRANSISTOR
Q054	2SD601ARTX	TRANSISTOR
Q055	2SD601ARTX	TRANSISTOR
Q090	2SB709ARTX	TRANSISTOR
Q092	2SB709ARTX	TRANSISTOR
Q321	2SB709ARTX	TRANSISTOR *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
Q322	2SD601ARTX	TRANSISTOR *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
Q351	2SC1573NC	TRANSISTOR *CT-1388YD, CT-1389VYD*
Q351	2SC3063RL	TRANSISTOR *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
Q352	2SC1573NC	TRANSISTOR *CT-1388YD, CT-1389VYD*

REPLACEMENT PARTS LIST

Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
Q352	2SC3063RL	TRANSISTOR *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
Q353	2SC1573NC	TRANSISTOR *CT-1388YD, CT-1389VYD*
Q353	2SC3063RL	TRANSISTOR *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
Q354	2SD601ARTX	TRANSISTOR
Q355	2SD601ARTX	TRANSISTOR
Q356	2SD601ARTX	TRANSISTOR
Q451	2SD601ARTX	TRANSISTOR
Q452	2SD601ARTX	TRANSISTOR
Q453	2SD601ARTX	TRANSISTOR
Q501	2SC1573AH	TRANSISTOR *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
Q501	2SC4212HLB	TRANSISTOR *CT-2788YD, CT-2789VYD*
Q505	2SD601ARTX	TRANSISTOR
Q520	2SD601ARTX	TRANSISTOR
Q551	**2SC5339LBMA1**	**TRANSISTOR *CT-2788YD, CT-2789VYD***
Q551	**2SD2499LBMA2**	**TRANSISTOR *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD***
Q605	2SB709ARTX	TRANSISTOR
Q606	2SD601ARTX	TRANSISTOR
Q820	2SA1767QTA	TRANSISTOR
Q830	2SB1011QRL	TRANSISTOR
Q2350	2SB709ARTX	TRANSISTOR
Q3002	2SD601ARTX	TRANSISTOR *CT-2789VYD*
Q3004	2SD601ARTX	TRANSISTOR *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
Q3005	2SD601ARTX	TRANSISTOR *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
Q3006	2SD601ARTX	TRANSISTOR *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*
		RELAYS
RL801	**TSEH0005**	**RELAY**
		RESISTORS
R001	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R003	ERJ6GEYJ105V	RES,M 1M-J-1/10W
R004	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R006	ERDS2TJ101T	RES,C 100-J-1/4W
R007	ERJ6GEYJ471V	RES,M 470-J-1/10W
R008	ERJ6GEYJ471V	RES,M 470-J-1/10W
R009	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R010	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W
R011	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W
R012	ERJ6GEYJ473V	RES,M 47K-J-1/10W
R013	ERJ6GEYJ202V	RES,M 2K-J-1/10W

REF NO.	PART NO.	DESCRIPTION
R014	ERJ6GEYJ221V	RES,M 220-J-1/10W
R015	ERJ6GEYJ221V	RES,M 220-J-1/10W
R016	ERJ6GEYJ221V	RES,M 220-J-1/10W
R017	ERJ6GEYJ681V	RES,M 680-J-1/10W
R018	ERJ6GEYJ681V	RES,M 680-J-1/10W
R019	ERJ6GEYJ681V	RES,M 680-J-1/10W
R021	ERJ6GEYJ101V	RES,M 100-J-1/10W
R022	ERJ6GEYJ101V	RES,M 100-J-1/10W
R023	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R024	ERJ6GEYJ153V	RES,M 15K-J-1/10W
R028	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R029	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R032	ERJ6ENF1002V	RES,M 10K-F-1/10W
R033	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W
R034	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W
R035	ERJ6GEYJ332V	RES,M 3.3K-J-1/10W
R036	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R037	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R038	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R039	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R040	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R041	ERJ6GEYJ153V	RES,M 15K-J-1/10W
R042	ERJ6GEYJ392V	RES,M 3.9K-J-1/10W
R043	ERJ6GEYJ103V	RES,M 10K-J-1/10W *CT-1389VYD, CT-2089VYD*
R043	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W *CT-2788YD*
R043	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W *CT-2789VYD*
R043	ERJ6GEYJ912V	RES,M 9.1K-J-1/10W *CT-1388YD*
R044	ERJ6GEYJ103V	RES,M 10K-J-1/10W *CT-2088YD*
R044	ERJ6GEYJ153V	RES,M 15K-J-1/10W *CT-2788YD, CT-2789VYD*
R044	ERJ6GEYJ182V	RES,M 1.8K-J-1/10W *CT-1389VYD*
R044	ERJ6GEYJ752V	RES,M 7.5K-J-1/10W *CT-1388YD*
R046	ERJ6GEYJ102V	RES,M 1K-J-1/10W *CT-1389VYD CT-2089VYD, CT-2789VYD*
R062	ERJ6GEYJ122V	RES,M 1.2K-J-1/10W
R063	ERJ6GEYJ122V	RES,M 1.2K-J-1/10W
R064	ERJ6GEYJ122V	RES,M 1.2K-J-1/10W
R065	ERJ6GEYJ272V	RES,M 2.7K-J-1/10W
R066	ERJ6GEYJ272V	RES,M 2.7K-J-1/10W
R067	ERJ6GEYJ272V	RES,M 2.7K-J-1/10W
R068	ERJ6GEYJ182V	RES,M 1.8K-J-1/10W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
R068	ERJ6GEYJ242V	RES,M 2.4K-J-1/10W *CT-1388YD, CT-1389VYD*
R069	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W
R070	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R071	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R072	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R077	ERJ6GEYJ103V	RES,M 10K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*

REPLACEMENT PARTS LIST

Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
R078	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R079	ERJ6GEYJ103V	RES,M 10K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R080	ERJ6GEYJ103V	RES,M 10K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R081	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R090	ERJ6GEYJ471V	RES,M 470-J-1/10W
R091	ERJ6GEYJ185V	RES,M 1.8MEG-J-1/10W
R092	ERJ6GEYJ473V	RES,M 47K-J-1/10W
R093	ERJ6GEYJ331V	RES,M 330-J-1/10W
R202	ERJ6GEYJ751V	RES,M 750-J-1/10W *CT-2789VYD*
R251	ERDS1TJ181T	RES,C 180-J-1/2W *CT-1388YD, CT-1389VYD*
R347	ERJ6GEYJ471V	RES,M 470-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R351	ERG2FJ123H	RES,M 12K-J-2W
R352	ERG2FJ123H	RES,M 12K-J-2W
R353	ERG2FJ123H	RES,M 12K-J-2W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
R354	ERDS1TJ272T	RES,C 2.7K-J-1/2W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
R355	ERDS1TJ272T	RES,C 2.7K-J-1/2W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
R356	ERDS1TJ272T	RES,C 2.7K-J-1/2W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
R357	ERJ6ENF5100V	RES,M 510-F-1/10W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
R357	ERJ6ENF6200V	RES,M 620-F-1/10W *CT-1388YD, CT-1389VYD*
R358	ERJ6ENF5100V	RES,M 510-F-1/10W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
R358	ERJ6ENF6200V	RES,M 620-F-1/10W *CT-1388YD, CT-1389VYD*
R359	ERJ6ENF5100V	RES,M 510-F-1/10W *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
R359	ERJ6ENF6200V	RES,M 620-F-1/10W *CT-1388YD, CT-1389VYD*
R360	ERJ6ENF4700V	RES,M 470-F-1/10W *CT-2788YD, CT-2789VYD*
R360	ERJ6ENF5100V	RES,M 510-F-1/10W *CT-2088YD, CT-2089VYD*
R360	ERJ6ENF6200V	RES,M 620-F-1/10W *CT-1388YD, CT-1389VYD*
R361	ERJ6ENF4700V	RES,M 470-F-1/10W *CT-2788YD, CT-2789VYD*
R361	ERJ6ENF5100V	RES,M 510-F-1/10W *CT-2088YD, CT-2089VYD*

REF NO.	PART NO.	DESCRIPTION
R361	ERJ6ENF6200V	RES,M 620-F-1/10W *CT-1388YD, CT-1389VYD*
R362	ERJ6ENF4700V	RES,M 470-F-1/10W *CT-2788YD, CT-2789VYD*
R362	ERJ6ENF5100V	RES,M 510-F-1/10W *CT-2088YD, CT-2089VYD*
R362	ERJ6ENF6200V	RES,M 620-F-1/10W *CT-1388YD, CT-1389VYD*
R363	ERJ6GEYJ101V	RES,M 100-J-1/10W
R364	ERJ6GEYJ101V	RES,M 100-J-1/10W
R365	ERJ6GEYJ101V	RES,M 100-J-1/10W
R369	ERG2FJ123H	RES,M 12K-J-2W *CT-1388YD, CT-1389VYD*
R374	ERDS1TJ272T	RES,C 2.7K-J-1/2W *CT-1388YD, CT-1389VYD*
R375	ERDS1TJ272T	RES,C 2.7K-J-1/2W *CT-1388YD, CT-1389VYD*
R376	ERDS1TJ272T	RES,C 2.7K-J-1/2W *CT-1388YD CT-1389VYD*
R377	ERJ6GEYJ471V	RES,M 470-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R378	ERJ6GEYJ471V	RES,M 470-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R379	ERJ6GEYJ471V	RES,M 470-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R380	ERJ6GEYJ102V	RES,M 1K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R381	ERJ6GEYJ101V	RES,M 100-J-1/10W
R382	ERJ6GEYJ101V	RES,M 100-J-1/10W
R383	ERJ6GEYJ101V	RES,M 100-J-1/10W
R384	ERJ6ENF2701V	RES,M 2.7K-F-1/10W
R385	ERJ6ENF4421V	RES,M 4.42K-F-1/10W
R386	ERJ6ENF1201V	RES,M 1.2K-F-1/10W
R387	ERJ6ENF2701V	RES,M 2.7K-F-1/10W
R388	ERJ6ENF4421V	RES,M 4.42K-F-1/10W
R389	ERJ6ENF1201V	RES,M 1.2K-F-1/10W
R390	ERJ6ENF2701V	RES,M 2.7K-F-1/10W
R391	ERJ6ENF4421V	RES,M 4.42K-F-1/10W
R392	ERJ6ENF1201V	RES,M 1.2K-F-1/10W
R450	ERJ6GEYJ563V	RES,M 56K-J-1/10W *CT-2088YD, CT-2089VYD*
R451	ERDS1FJ1R0P	RES,C 1.0-J-1/2W *CT-2788YD, CT-2789VYD*
R451	ERDS1FJ1R2P	RES,C 1.2-J-1/2W *CT-2088YD, CT-2089VYD*
R451	ERDS1FJ1R8P	RES,C 1.8-J-1/2W *CT-1388YD, CT-1389VYD*
R454	ERJ6GEYJ473V	RES,M 47K-J-1/10W
R455	ERJ6GEYJ153V	RES,M 15K-J-1/10W *CT-1388YD, CT-1389VYD CT-2088YD, CT-2089VYD*

REPLACEMENT PARTS LIST

Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
R455	ERJ6GEYJ183V	RES,M 18K-J-1/10W *CT-2788YD, CT-2789VYD*
R456	ERJ6GEYJ223V	RES,M 22K-J-1/10W *CT-2788YD, CT-2789VYD*
R456	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W *CT-2088YD, CT-2089VYD*
R456	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W *CT-1388YD, CT-1389VYD*
R457	ERJ6GEYJ152V	RES,M 1.5K-J-1/10W *CT-2088YD, CT-2089VYD*
R457	ERJ6GEYJ182V	RES,M 1.8K-J-1/10W *CT-1388YD, CT-1389VYD* *CT-2788YD, CT-2789VYD*
R458	ERJ6GEYJ223V	RES,M 22K-J-1/10W *CT-1388YD, CT-1389VYD*
R458	ERJ6GEYJ333V	RES,M 33K-J-1/10W *CT-2088YD, CT-2089VYD* *CT-2788YD, CT-2789VYD*
R459	ERJ6GEYJ683V	RES,M 68K-J-1/10W
R460	ERDS2TJ102T	RES,C 1K-J-1/4W
R461	ERDS2TJ152T	RES,C 1.5K-J-1/4W *CT-1388YD, CT-1389VYD*
R462	ERJ6GEYJ473V	RES,M 47K-J-1/10W
R463	ERJ6GEYJ473V	RES,M 47K-J-1/10W
R465	ERJ6GEYJ183V	RES,M 18K-J-1/10W *CT-1388YD, CT-1389VYD* *CT-2788YD, CT-2789VYD*
R465	ERJ6GEYJ303V	RES,M 30K-J-1/10W *CT-2088YD, CT-2089VYD*
R466	ERJ6GEYJ683V	RES,M 68K-J-1/10W *CT-1388YD, CT-1389VYD* *CT-2788YD, CT-2789VYD*
R467	ERJ6GEYJ104V	RES,M 100K-J-1/10W *CT-1388YD, CT-1389VYD* *CT-2788YD, CT-2789VYD*
R467	ERJ6GEYJ183V	RES,M 18K-J-1/10W *CT-2088YD, CT-2089VYD*
R468	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R469	ERJ6GEYJ100V	RES,M 10-J-1/10W *CT-1388YD, CT-1389VYD*
R469	ERJ6GEYJ220V	RES,M 22-J-1/10W *CT-2088YD, CT-2089VYD* *CT-2788YD, CT-2789VYD*
R470	ERDS2TJ152T	RES,C 1.5K-J-1/4W *CT-1388YD, CT-1389VYD* *CT-2088YD, CT-2089VYD*
R471	ERJ6GEYJ223V	RES,M 22K-J-1/10W
R472	ERJ6GEYJ473V	RES,M 47K-J-1/10W
R475	ERJ6GEYJ471V	RES,M 470-J-1/10W
R502	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R504	ERDS2TJ152T	RES,C 1.5K-J-1/4W *CT-1388YD, CT-1389VYD* *CT-2088YD, CT-2089VYD*
R504	ERDS2TJ681T	RES,C 680-J-1/4W *CT-2788YD, CT-2789VYD*
R505	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W
R506	ERJ6GEYJ333V	RES,M 33K-J-1/10W
R507	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R508	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R510	**ERG3FJ182**	**RES,M 1.8K-J-3W** ***CT-2088YD, CT-2089VYD*** ***CT-2788YD, CT-2789VYD***
R510	**ERG3FJ332**	**RES,M 3.3K-J-2W** ***CT-1388YD, CT-1389VYD***
R511	**ERG3FJ182**	**RES,M 1.8K-J-3W** ***CT-2788YD, CT-2789VYD***
R512	ERG2FJ392H	RES,M 3.9K-J-2W *CT-2788YD, CT-2789VYD*
R512	ERG2FJ562H	RES,M 5.6K-J-2W *CT-1388YD, CT-1389VYD* *CT-2088YD, CT-2089VYD*
R520	ERJ6GEYJ331V	RES,M 330-J-1/10W *CT-2788YD, CT-2789VYD*
R520	ERJ6GEYJ471V	RES,M 470-J-1/10W *CT-1388YD, CT-1389VYD* *CT-2088YD, CT-2089VYD*
R521	ERJ6GEYJ102V	RES,M 1K-J-1/10W *CT-2788YD, CT-2789VYD*
R521	ERJ6GEYJ272V	RES,M 2.7K-J-1/10W *CT-1388YD, CT-1389VYD* *CT-2088YD, CT-2089VYD*
R531	**ERD25FJ470P**	**RES,C 47-J-1/4W**
R532	**ERJ6ENF1002V**	**RES,M 10K-F-1/10W** ***CT-1388YD, CT-1389VYD*** ***CT-2788YD, CT-2789VYD***
R532	**ERJ6ENF1372V**	**RES,M 13.7K-F-1/10W** ***CT-2088YD, CT-2089VYD***
R533	**ERJ6ENF1691V**	**RES,M 1.69K-F-1/10W** ***CT-1388YD, CT-1389VYD***
R533	**ERJ6ENF1781V**	**RES,M 1.78K-F-1/10W** ***CT-2788YD, CT-2789VYD***
R533	**ERJ6ENF1821V**	**RES,M 1.82K-F-1/10W** ***CT-2088YD, CT-2089VYD***
R551	**ERDS1FJ1R0T**	**RES,C 1.0-J-1/2W**
R552	**ERDS1FJ1R0T**	**RES,C 1.0-J-1/2W**
R555	**ERDS1FJ101T**	**RES,C 100-J-1/2W** ***CT-1388YD, CT-1389VYD*** ***CT-2088YD, CT-2089VYD***
R556	ERG1SJ221P	RES,M 220-J-1W
R557	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R558	**ERQ1CJP1R5S**	**RES,F 1.5-J-1W** ***CT-1388YD, CT-1389VYD***
R558	**ERQ1CKPR56S**	**RES,F .56-K-1W** ***CT-2788YD, CT-2789VYD***
R558	**ERQ2CJP2R7S**	**RES,F 2.7-J-2W** ***CT-2088YD, CT-2089VYD***
R559	ERG2FJ683H	RES,M 12K-J-2W *CT-1389VYD* *CT-2089VYD, CT-2789VYD*
R560	ERDS1FJ182P	RES,C 1.8K-J-1/2W *CT-1388YD, CT-1389VYD*
R561	ERG2FJ102H	RES,M 1K-J-2W *CT-2788YD, CT-2789VYD*
R562	ERG3FJ680H	RES,M 68-J-3W *CT-1389VYD* *CT-2089VYD, CT-2789VYD*

REPLACEMENT PARTS LIST

Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
R563	ERG1SJ150P	RES,M 15-J-1W
R567	ERG2FJ122H	RES,M 12K-J-2W *CT-2088YD, CT-2089VYD*
R567	ERG2FJ471H	RES,M 470-J-2W *CT-1388YD, CT-1389VYD*
R572	ERJ6GEYJ152V	RES,M 1.5K-J-1/10W *CT-2788YD, CT-2789VYD*
R572	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W *CT-2088YD, CT-2089VYD*
R572	ERJ6GEYJ392V	RES,M 3.9K-J-1/10W *CT-1388YD, CT-1389VYD*
R605	ERDS2TJ103T	RES,C 10K-J-1/4W
R606	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W
R607	ERJ6GEYJ102V	RES,M 1K-J-1/10W
R608	ERJ6GEYJ104V	RES,M 100K-J-1/10W
R801	**ERF7ZK1R5**	**RES,W 1.5-K-7W**
R802	ERDS2TJ684T	RES,C 680K-J-1/4W
R803	ERG2FJ100H	RES,M 10K-J-1/2W
R804	ERG2FJ104H	RES,M 100K-J-2W
R805	**ERX2FJR27H**	**RES,C .27-J-2W** ***CT-1388YD, CT-1389VYD***
R805	**ERX2FZJR18H**	**RES,M 18-J-2W** ***CT-2088YD,CT-2089VYD*** ***CT-2788YD, CT-2789VYD***
R806	**ERX2FJR56H**	**RES,M .56-J-2W** ***CT-2088YD,CT-2089VYD*** ***CT-2788YD, CT-2789VYD***
R807	ERDS2TJ681T	RES,C 680-J-1/4W
R808	ERDS2TJ4R7T	RES,C 4.7-J-1/4W
R809	ERDS2TJ472T	RES,C 4.7K-J-1/4
R815	**ERC12ZGM825D**	**RES,S 8.2MEG-M-1/2**
R817	**ERX3FJ4R7**	**RES,M 4.7-J-3W** ***CT-1388YD, CT-1389VYD***
R817	**ERX3FJ6R8**	**RES,M 6.8-J-3W** ***CT-2088YD, CT-2089VYD***
R821	ERDS1FJ1R0T	RES,C 1.0-J-1/2W *CT-1388YD,CT-1389VYD* *CT-2788YD, CT-2789VYD*
R821	ERDS1FJ1R5T	RES,C 1.5-J-1/2W *CT-2088YD, CT-2089VYD*
R822	ERDS1FJ1R0T	RES,C 1.0-J-1/2W *CT-2788YD, CT-2789VYD*
R822	ERDS1FJ1R5T	RES,C 1.5-J-1/2W *CT-2088YD, CT-2089VYD*
R823	ERDS1FJ272T	RES,C 2.7K-J-1/2W
R824	ERDS2TJ223T	RES,C 22K-J-1/4W
R825	ERDS2TJ272T	RES,C 2.7K-J-1/4W
R828	ERJ6GEYJ104V	RES,M 100K-J-1/10W
R830	ERDS2TJ104T	RES,C 100K-J-1/4W
R831	ERDS2TJ682T	RES,C 6.8K-J-1/4W
R850	**ERQ12HJR56P**	**RES,F .56-J-1/2W**
R1002	ERJ6GEYJ101V	RES,M 100-J-1/10W *CT-2788YD, CT-2789VYD*
R1003	ERJ6GEYJ101V	RES,M 100-J-1/10W *CT-2788YD, CT-2789VYD*
R1008	ERJ6GEYJ102V	RES,M 1K-J-1/10W *CT-1388YD, CT-1389VYD* *CT-2088YD, CT-2089VYD*
R2201	ERJ6GEYJ224V	RES,M 220K-J-1/10W *CT-2789VYD*
R2203	ERJ6GEYJ102V	RES,M 1K-J-1/10W *CT-2789VYD*
R2204	ERJ6GEYJ102V	RES,M 1K-J-1/10W *CT-2789VYD*
R2205	ERJ6GEYJ101V	RES,M 100-J-1/10W *CT-2789VYD*
R2206	ERJ6GEYJ273V	RES,M 27K-J-1/10W *CT-2789VYD*
R2301	ERQ2CJP3R9S	RES,F 3.9-J-2W
R2307	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R2336	ERJ6GEYJ105V	RES,M 1M-J-1/10W *CT-2788YD, CT-2789VYD*
R2337	ERJ6GEYJ101V	RES,M 100-J-1/10W *CT-2788YD, CT-2789VYD*
R2338	ERJ6GEYJ101V	RES,M 100-J-1/10W *CT-2788YD, CT-2789VYD*
R2339	ERJ6GEYJ105V	RES,M 1M-J-1/10W *CT-2788YD, CT-2789VYD*
R2350	ERDS2TJ102T	RES,C 1K-J-1/4W *CT-1388YD, CT-1389VYD,* *CT-2088YD, CT-2089VYD*
R2350	ERDS2TJ391T	RES,C 390-J-1/4W *CT-2788YD, CT-2789VYD*
R2351	ERJ6GEYJ273V	RES,M 27K-J-1/10W *CT-1388YD, CT-1389VYD,* *CT-2088YD, CT-2089VYD*
R2351	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W *CT-2788YD, CT-2789VYD*
R2352	ERJ6GEYJ683V	RES,M 68K-J-1/10W *CT-2788YD, CT-2789VYD*
R2353	ERJ6GEYJ124V	RES,M 120K-J-1/10W *CT-2788YD, CT-2789VYD*
R2354	ERJ6GEYJ123V	RES,M 12K-J-1/10W
R2355	ERJ6GEYJ222V	RES,M 2.2K-J-1/10W *CT-2788YD, CT-2789VYD*
R2355	ERJ6GEYJ392V	RES,M 3.9K-J-1/10W *CT-1388YD, CT-1389VYD* *CT-2088YD, CT-2089VYD*
R2356	ERJ6GEYJ101V	RES,M 100-J-1/10W
R2357	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W
R2365	ERDS2TJ102T	RES,C 1K-J-1/4W
R2370	ERJ6GEYJ103V	RES,M 10K-J-1/10W
R3001	ERDS2TJ101T	RES,C 100-J-1/4W
R3023	ERJ6GEYJ183V	RES,M 18K-J-1/10W *CT-1388YD,CT-1389VYD* *CT-2088YD, CT-2089VYD*
R3024	ERJ6GEYJ473V	RES,M 47K-J-1/10W *CT-1388YD,CT-1389VYD* *CT-2088YD, CT-2089VYD*
R3026	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W *CT-2789VYD*

REPLACEMENT PARTS LIST

Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
R3028	ERJ6GEYJ823V	RES,M 82K-J-1/10W *CT-2789VYD*
R3029	ERJ6GEYJ102V	RES,M 1K-J-1/10W *CT-2789VYD*
R3031	ERJ6GEYJ303V	RES,M 30K-J-1/10W *CT-2789VYD*
R3032	ERJ6GEYJ102V	RES,M 1K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R3037	ERJ6GEYJ221V	RES,M 220-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R3038	ERJ6GEYJ471V	RES,M 470-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R3039	ERJ6GEYJ471V	RES,M 470-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R3040	ERJ6GEYJ473V	RES,M 47K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R3041	ERJ6GEYJ750V	RES,M 75-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R3043	ERJ6GEYJ102V	RES,M 1K-J-1/10W *CT-2789VYD*
R3049	ERJ6GEYJ221V	RES,M 220-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R3050	ERJ6GEYJ101V	RES,M 100-J-1/10W
R3051	ERJ6GEYJ101V	RES,M 100-J-1/10W
R3052	ERJ6GEYJ303V	RES,M 30K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R3053	ERJ6GEYJ472V	RES,M 4.7K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R3070	ERJ6GEYJ390V	RES,M 39-J-1/10W
R3071	ERJ6GEYJ390V	RES,M 39-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD*
R3072	ERJ6GEYJ390V	RES,M 39-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD*
R3073	ERJ6GEYJ102V	RES,M 1K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R3074	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W *CT-2789VYD*
R3076	ERJ6GEYJ223V	RES,M 22K-J-1/10W *CT-2788YD, CT-2789VYD*
R3078	ERJ6GEYJ183V	RES,M 18K-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD*
R3078	ERJ6GEYJ223V	RES,M 22K-J-1/10W *CT-2788YD, CT-2789VYD*
R3079	ERJ6GEYJ473V	RES,M 47K-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD*
R3085	ERJ6GEYJ102V	RES,M 1K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
R3086	ERJ6GEYJ102V	RES,M 1K-J-1/10W *CT-2789VYD*
R3090	ERD25TJ750T	RES,C 75-J-1/4W
R3090	ERJ6GEYJ103V	RES,M 10K-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD*
R3091	ERD25TJ750T	RES,C 75-J-1/4W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD*
R3091	ERJ6GEYJ103V	RES,M 10K-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD*
R3092	ERD25TJ750T	RES,C 75-J-1/4W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD*
R3200	ERJ6GEYJ562V	RES,M 5.6K-J-1/10W *CT-2789VYD*
R3201	ERD25TJ750S	RES,C 75-J-1/4W
R3202	ERD25TJ750T	RES,C 75-J-1/4W
R3202	ERJ6GEYJ183V	RES,M 18K-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD*
R3203	ERJ6GEYJ473V	RES,M 47K-J-1/10W *CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD*
R3204	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W *CT-2788YD, CT-2789VYD*
R3205	ERJ6GEYJ682V	RES,M 6.8K-J-1/10W *CT-2788YD, CT-2789VYD*
R3207	ERJ6GEYJ823V	RES,M 82K-J-1/10W *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
		SWITCHES
S001	EVQPF106K	SWITCH
S002	EVQPF106K	SWITCH
S003	EVQPF106K	SWITCH
S004	EVQPF106K	SWITCH
S005	EVQPF106K	SWITCH
S008	EVQPF106K	SWITCH
S009	EVQPF106K	SWITCH *CT-1388YD CT-1389VYD, CT-2088YD CT-2089VYD, CT-2789VYD*
		TRANSFORMERS
T501	**TLH15452**	**TRANSFORMER, HORIZONTAL DRIVE**
T551	**KFT2AB118F**	**TRANSFORMER, FLYBACK *CT-1388YD, CT-1389VYD***
T551	**KFT3AA341F**	**TRANSFORMER, FLYBACK *CT-2088YD, CT-2089VYD***
T551	**KFT4AA348F**	**TRANSFORMER, FLYBACK *CT-2788YD, CT-2789VYD***

REPLACEMENT PARTS LIST

Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
T801	**ETS29AS183NC**	**TRANSFORMER** ***CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD***
T801	**ETS35AA5G3NC**	**TRANSFORMER** ***CT-2788YD, CT-2789VYD***
		CRYSTALS/FILTERS
X001	TSSA092	CRYSTAL OSCILLATOR
X002	AF080005BE	CRYSTAL OSCILLATOR
		OTHERS
TNR001	**ENG36604G**	**TUNER** ***CT-1389VYD CT-2089VYD, CT-2789VYD***
M001	**TSX2AA0151-1**	**A/C LINE CORD**
M002	**37GDA85X(M)**	**CRT 13"** ***CT-1388YD, CT-1389VYD***
M003	**A51KQN011X**	**CRT 20"** ***CT-2088YD, CT-2089VYD***
M004	**M68LGL061X**	**CRT 27"** ***CT-2788YD, CT-2789VYD***
M005	**TJSC00200**	**SOCKET, CRT** ***CT-1388YD, CT-1389VYD***
M006	**TJSC00300**	**CRT SOCKET** ***CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD***
DY	**TLY2AA006**	**DEFLECTION YOKE** ***CT-2788YD, CT-2789VYD***
DY	**TLY2AA010**	**DEFLECTION YOKE** ***CT-2088YD, CT-2089VYD***
DY	**0LY15311F**	**YOKE, DEFLECTION** ***CT-1388YD, CT-1389VYD***
M007	JH225U-012	YOKE, CONVERGENCE *CT-1388YD, CT-1389VYD*
M008	JH291U-009	YOKE, CONVERGENCE *CT-2788YD, CT-2789VYD*
M009	TXF3A01TLR2	ASSY., DAG GND *CT-1388YD, CT-1389VYD*
M010	TXF3A01ZERA	ASSY., DAG GND *CT-2788YD, CT-2789VYD*
M011	TXF3A011DB2	ASSY. DAG GROUND *CT-2088YD, CT-2089VYD*
DEG	**TLK2AA0011**	**COIL, DEGAUSSING 27"** ***CT-2788YD, CT-2789VYD***
DEG	**TSP2AA008**	**COIL, DEGAUSSING 20"** ***CT-2088YD, CT-2089VYD***
DEG	**TSP2AA010**	**COIL, DEGAUSSING 13"** ***CT-1388YD, CT-1389VYD***
M012	TXANV03ESER	DEG. COIL INST. KIT Strap Wire Ties *CT-2088YD, CT-2089VYD*
M013	TMM2A30702	WEDGE, YOKE
M014	0FMK014ZZ	CONVERGENCE CORRECTOR STRIP
M015	TXFKY42ESER	ASSY, CABINET FRONT Cab. 13", Smoke Sheet, Badge, Label Service Info *CT-1388YD*
M016	TXFKY43ESER	ASSY, CABINET FRONT Cab. 13", Smoke Sheet, Badge, IR Guide, Label *CT-1389VYD*
M017	TXFKY44ESER	ASSY, CABINET FRONT Cab. 20", Smoke Sheet, Badge, Label X-ray Warning (EN) *CT-2088YD*
M018	TXFKY45ESER	ASSY, CABINET FRONT Cab. 20", Smoke Sheet, Badge, IR Guide, Label X-ray Warning (EN) *CT-2089VYD*
M019	TXFKY46ESER	ASSY, CABINET FRONT Cab. 27", Badge, Smoke Sheet, Label Service Info, Pad Foam *CT-2788YD*
M020	TXFKY47ESER	ASSY, CABINET FRONT Cab. 27", Badge, IR Guide, Smoke Sheet, Label Service Info, Pad Foam *CT-2789VYD*
M021	EASG9D538S2	SPEAKER *CT-2788YD, CT-2789VYD*
M022	TAS2AA0012	SPEAKER 16-OHM 1.5W *CT-2088YD, CT-2089VYD*
M023	TAS2AA0014	SPEAKER 16-OHM 1.5W *CT-1388YD, CT-1389VYD*
M024	TBM2A10141	BADGE, PANASONIC *CT-2088YD, CT-2089VYD CT-2788YD, CT-2789VYD*
M025	TBM2A30832	BADGE, PANASONIC *CT-1388YD, CT-1389VYD*
M026	TBX2AA00601G	BUTTON, 7-KEY *CT-2088YD, CT-2089VYD*
M027	TBX2AA1101G	BUTTON, 7-KEY *CT-1388YD, CT-1389VYD*
M028	TBX2AA1301G	BUTTON, 7-KEY *CT-2789VYD*
M029	TBX2AA1302G	BUTTON, 7-KEY *CT-2788YD*
M030	TJS1A7010	CONNECTOR EARPHONE JACK *CT-1388YD, CT-1389VYD*
M031	TKP2AA00601	SMOKED SHEET
M032	TKX2A3751	GUIDE, IR *CT-1389VYD*
M033	TKX2A3753	GUIDE, IR *CT-2089VYD*
M034	TKX2A3756	GUIDE, IR *CT-2789VYD*
M035	TXFKU2897SER	ASSY, CABINET BACK Cover Cabinet Back, Felt, Label X-ray Warning (FR), Label X-ray Warning (EN), Label info, FCC Label *CT-1388YD*
M036	TXFKU31ESER	ASSY, CABINET BACK Nameplate Model, Cover Cabinet Back, Felt, X-ray Warning Label (FR), FCC Label, Label Info *CT-2088YD*
M037	TXFKU32ESER	ASSY, CABINET BACK Cover Cabinet Back, Nameplate Model, Felt, X-ray Warning Label (FR), FCC Label, Warning Label, Label Info *CT-2089VYD*

REPLACEMENT PARTS LIST

Models: CT-1388YD, CT-1389VYD, CT-2088YD, CT-2089VYD, CT-2788YD & CT-2789VYD

Important Safety Notice: Components printed in **BOLD TYPE** have special characteristics important for safety. When replacing any of these components use only manufacturer's specified parts.

REF NO.	PART NO.	DESCRIPTION
M038	TXFKU33ESER	ASSY, CABINET BACK Nameplate Model, Cover Cabinet Back, Felt, Label, Caution (FR), X-ray Warning Label (FR), FCC Label, X-ray Warning Label (EN) *CT-2788YD*
M039	TXFKU34ESER	ASSY, CABINET BACK Nameplate Model, Cover Cabinet Back, Felt, X-ray Warning Label (FR), FCC Label, Warning Label, Label info, X-ray Warning Label (EN) *CT-2789VYD*
M040	TXFKU59ASER	ASSY, CABINET BACK Nameplate Model, Cover Cabinet Back, Felt, X-ray Warning Label (FR), FCC Label, Label Info, X-ray Warning Label (EN) *CT-1389VYD*

REF NO.	PART NO.	DESCRIPTION
M041	TJS2A9560	CONNECTOR, S-VHS
M042	TJS1A4560	CONNECTOR, BNC WITH SWITCH
M043	TJS2A48061	CONNECTOR, BNC WITHOUT SWITCH
		ACCESORIES
M044	EUR501450	REMOTE CONTROL *CT-1389VYD* *CT-2089VYD, CT-2789VYD*
M045	UR50EC1190A	BATTERY COVER, REMOTE CONTROL *CT-1389VYD* *CT-2089VYD, CT-2789VYD*
M046	TQB2AA0386	MANUAL, OWNERS
M047	TQB2AA7057	REMOTE GUIDE *CT-1389VYD* *CT-2089VYD, CT-2789VYD*
M048	TQB2AA7108	V-CHIP MANUAL *CT-1389VYD* *CT-2089VYD, CT-2789VYD*

DESCRIPTION OF ABBREVIATIONS GUIDE

RESISTOR			
TYPE		TOLERANCE	
C	Carbon	F	+/- 1%
F	Fuse	J	+/- 5%
M	Metal Oxide	K	+/- 10%
S	Solid	M	+/- 20%
W	Wire Wound	G	+/- 2%

RES, C 270-J-1/4

CAPACITOR			
TYPE		TOLERANCE	
C	Ceramic	C	+/- 0.25pF
E	Electrolytic	D	+/- 0.5pF
P	Polyester	F	+/- 1pF
S	Styrol	J	+/- 5%
T	Tantalum	K	+/- 10%
		L	+/- 15%
		M	+/- 20%
		P	+10% -0%
		Z	+80% -20%

CAP, P .068UF-K-50V

NOTES:

SCHEMATIC NOTES:

1. RESISTOR

All resistors are carbon 1/4W resistor, unless otherwise noted by the following marks.
Unit of resistance is ohm (Ω), (K=1,000, M=1,000,000)

◯	Non Flammable	△	Solid
☒	Metal Oxide	◎	Metal (Precision and high stability)
□	Wire Wound	▬	Thermistor
⊗	Fusible	▭	Positive coefficient Thermistor
▨	Flame Proof Rectangular		

2. CAPACITOR

All capacitors are ceramic 50V capacitor, unless otherwise noted by the following marks.
Unit of capacitance is μF, unless otherwise noted.

+⊟-	Electrolytic	☒	Metalized Polyester
Ⓣ	Tantalum	ⓜ	Polyprolene
NP	Bipolar	△	Mica
Ⓢ	Polystyrene	◯	Ceramic
⊗	Temperature Compensation	◎	Ceramic (SL)
Ⓜ	Polyester		

3. COIL

Unit of inductance is μH, unless otherwise noted.

4. VOLTAGE MEASUREMENT

Voltage is measured by a digital meter receiving normal signal.

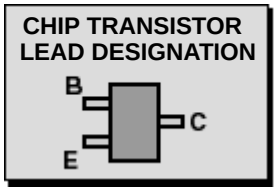
Note: *These schematic diagrams are the latest at the time of printing and are subject to change without notice.*

SERVICE NOTES:

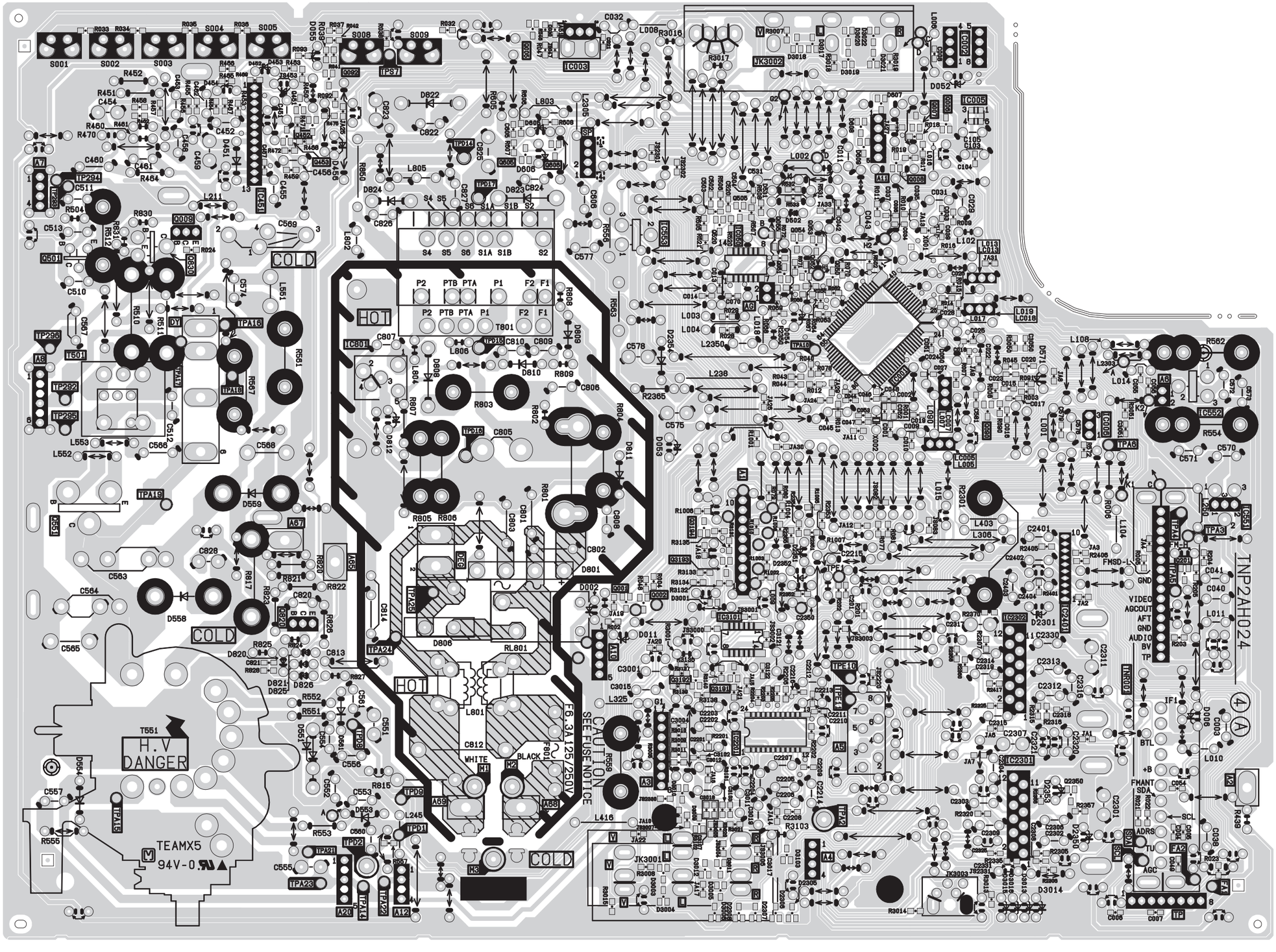
This model has section that does not share a common ground with the power supply section. The different sections are referred to as HOT section and COLD section in the precautions below.

1. Do not touch the HOT section and the COLD section at the same time. You may receive an electric shock.
2. Do not short the HOT section to the COLD section. This could blow the fuse or damage parts.
3. Never measure the HOT section and the COLD section at the same time when using tools such as oscilloscopes or multimeters.
4. Always unplug the unit before beginning any operation such as removing the chassis.

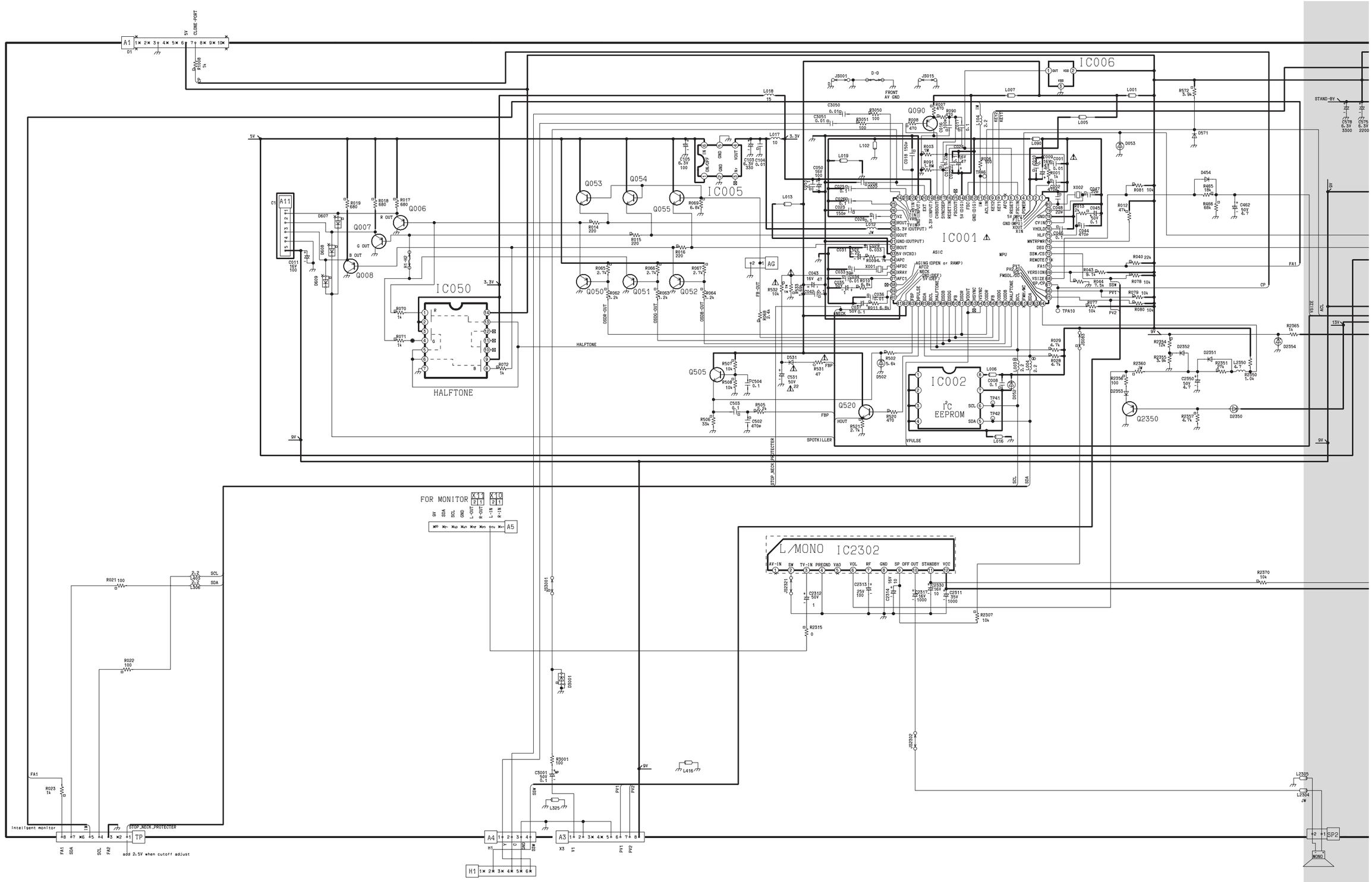
Chip Transistor Lead Designation

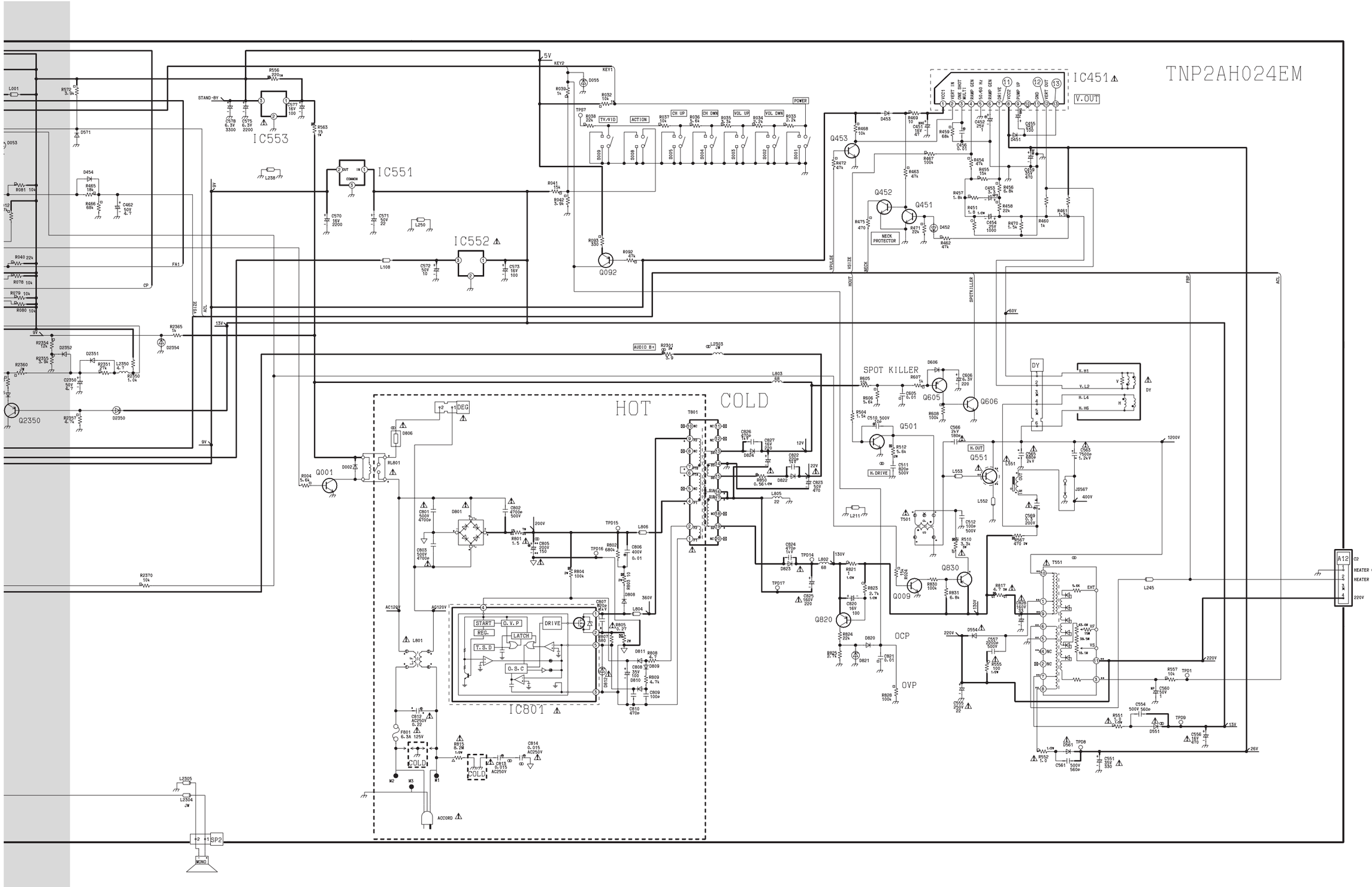


A-Board Layout -- Diagrama Impreso Tarjeta-A

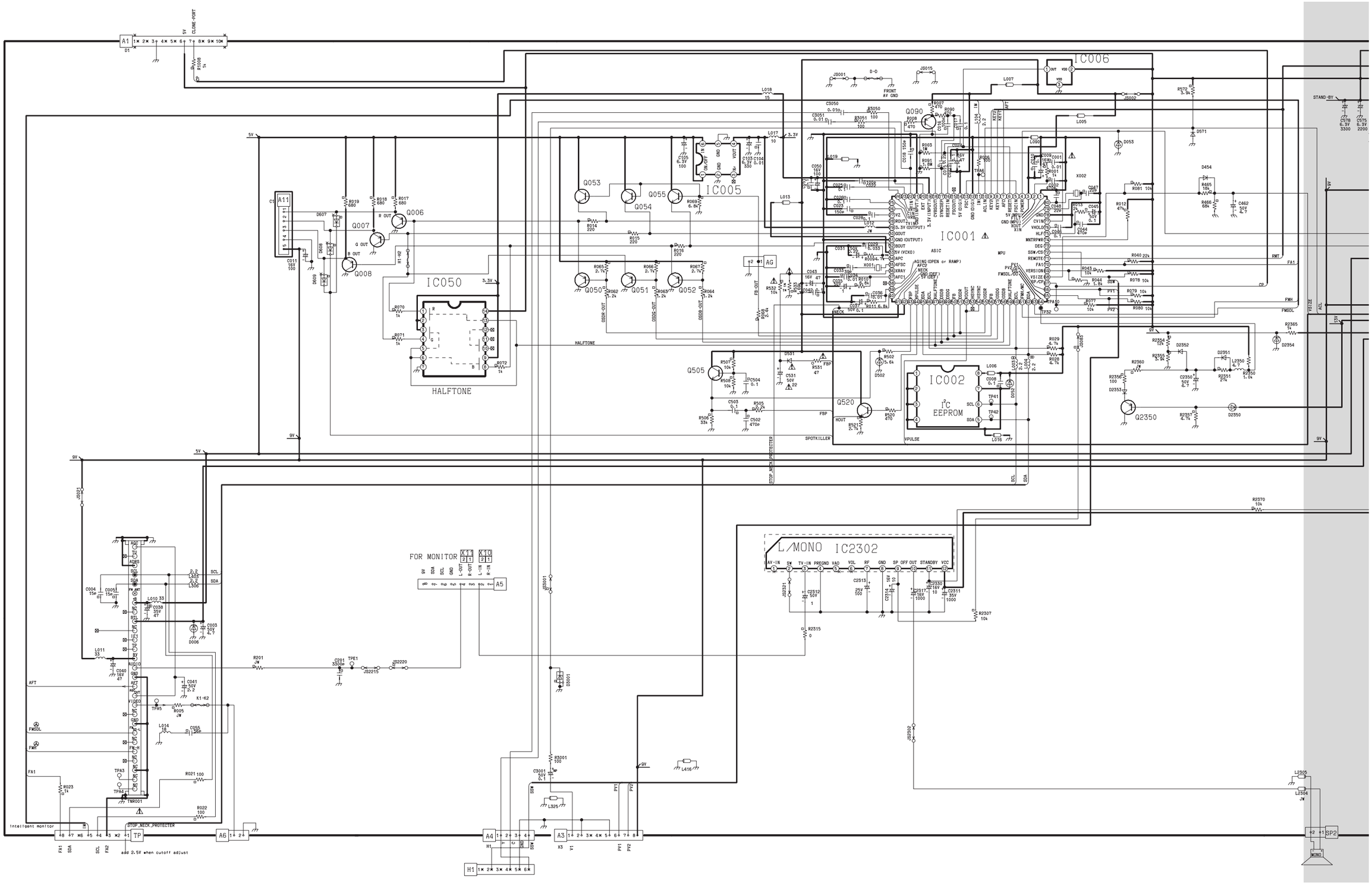


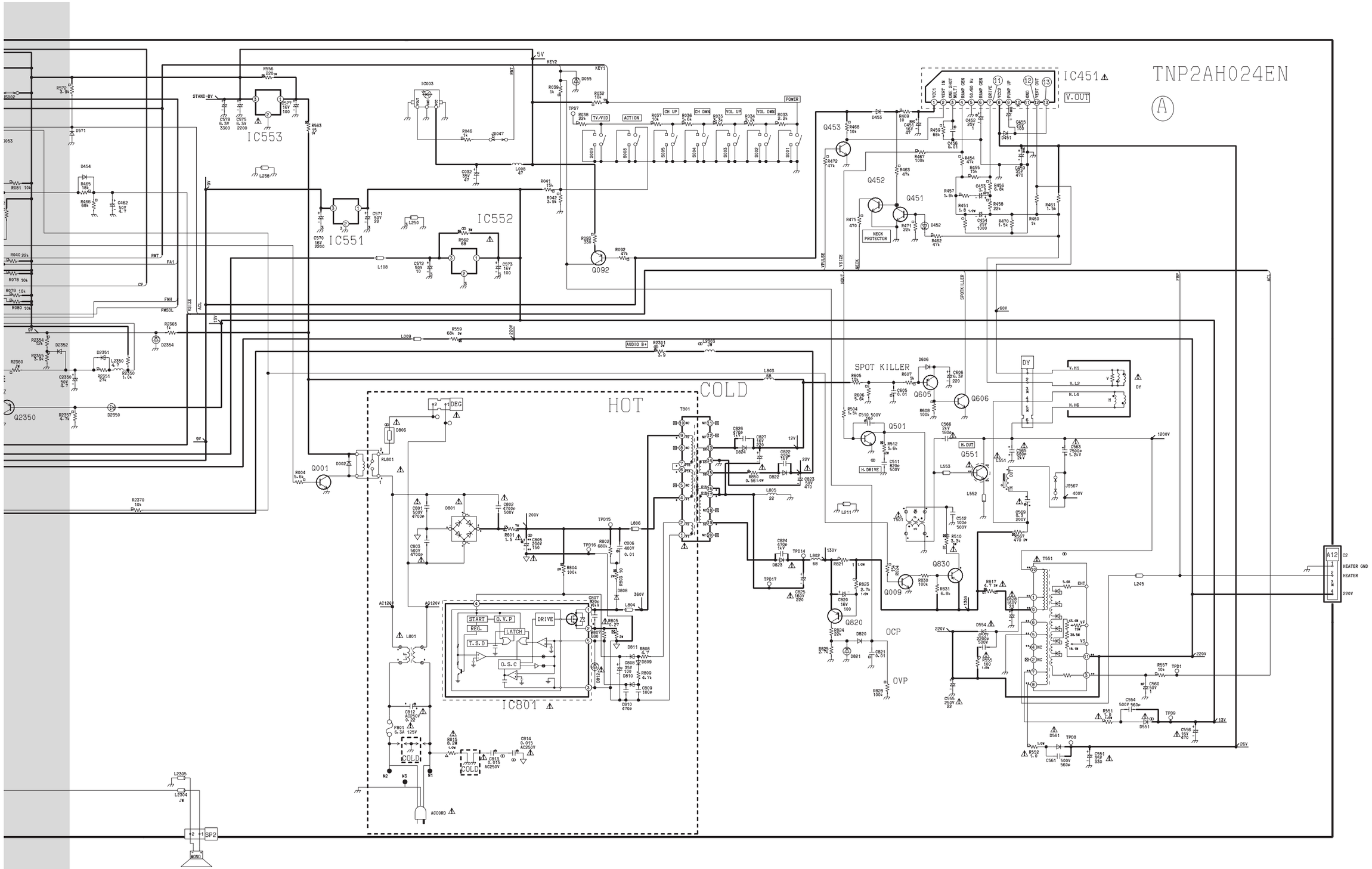
A-Board Schematic Left Portion -- Diagrama Eléctrico Tarjeta-A Porcion Izquierda



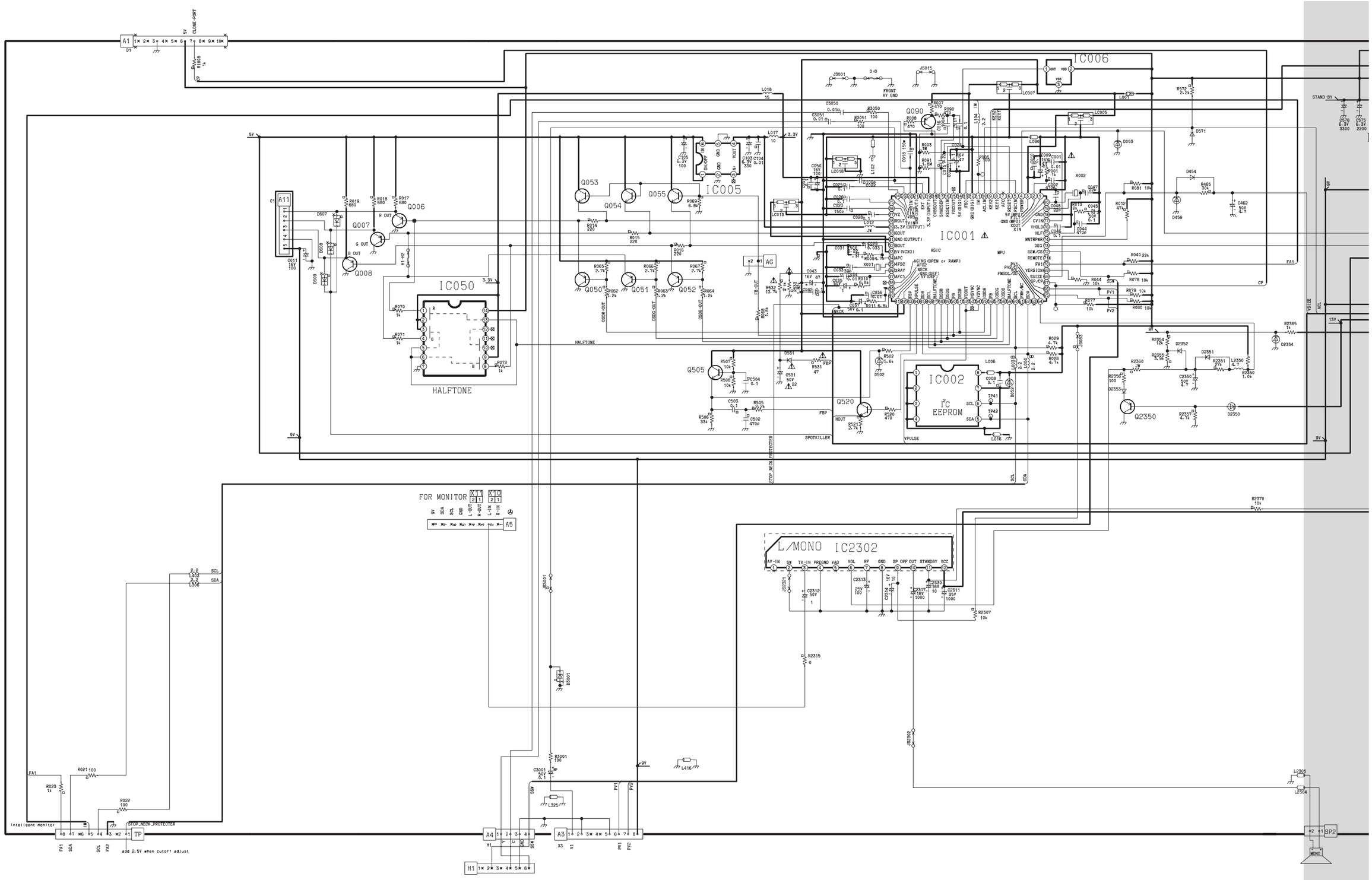

TNP2AH024EM
IC451
V.OUT
IC553
IC551
IC552
Q092
Q452
Q451
NECK PROTECTOR
SPOT KILLER
Q606
Q605
Q501
H. DRIVE
Q551
H. OUT
Q830
Q009
Q820
OCP
OVP
HOT
COLD
Q001
RL801
IC801
START
O.V.P
DRIVE
REG.
LATCH
T.S.D
O.S.C
TV/VID
ACTION
CH UP
CH DWN
VOL UP
VOL DWN
POWER
DY
EHT
HEATER GND
HEATER
220V
26V
13V
SP2
MONO

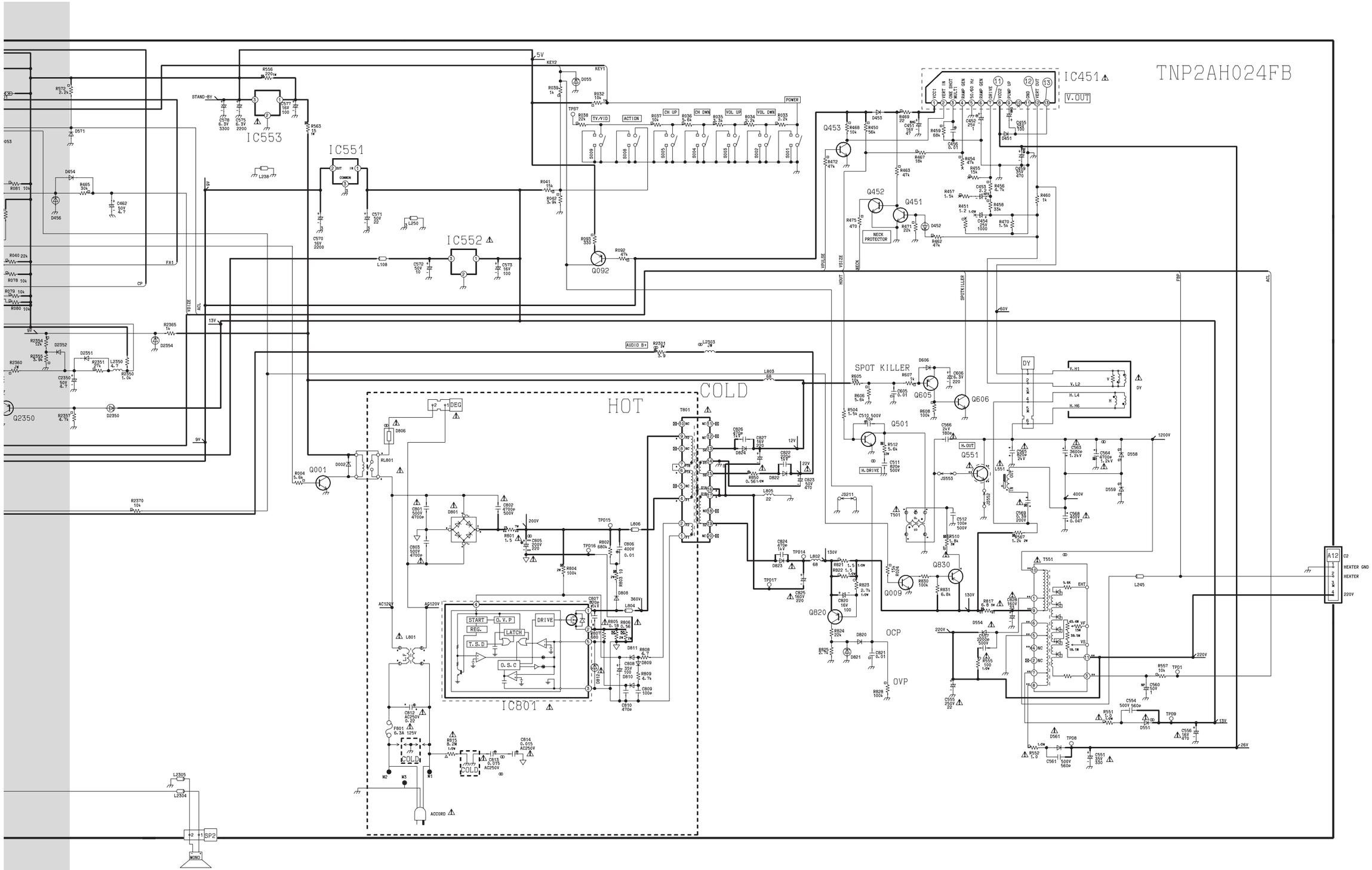
A-Board Schematic Left Portion -- Diagrama Eléctrico Tarjeta-A Porcion Izquierda



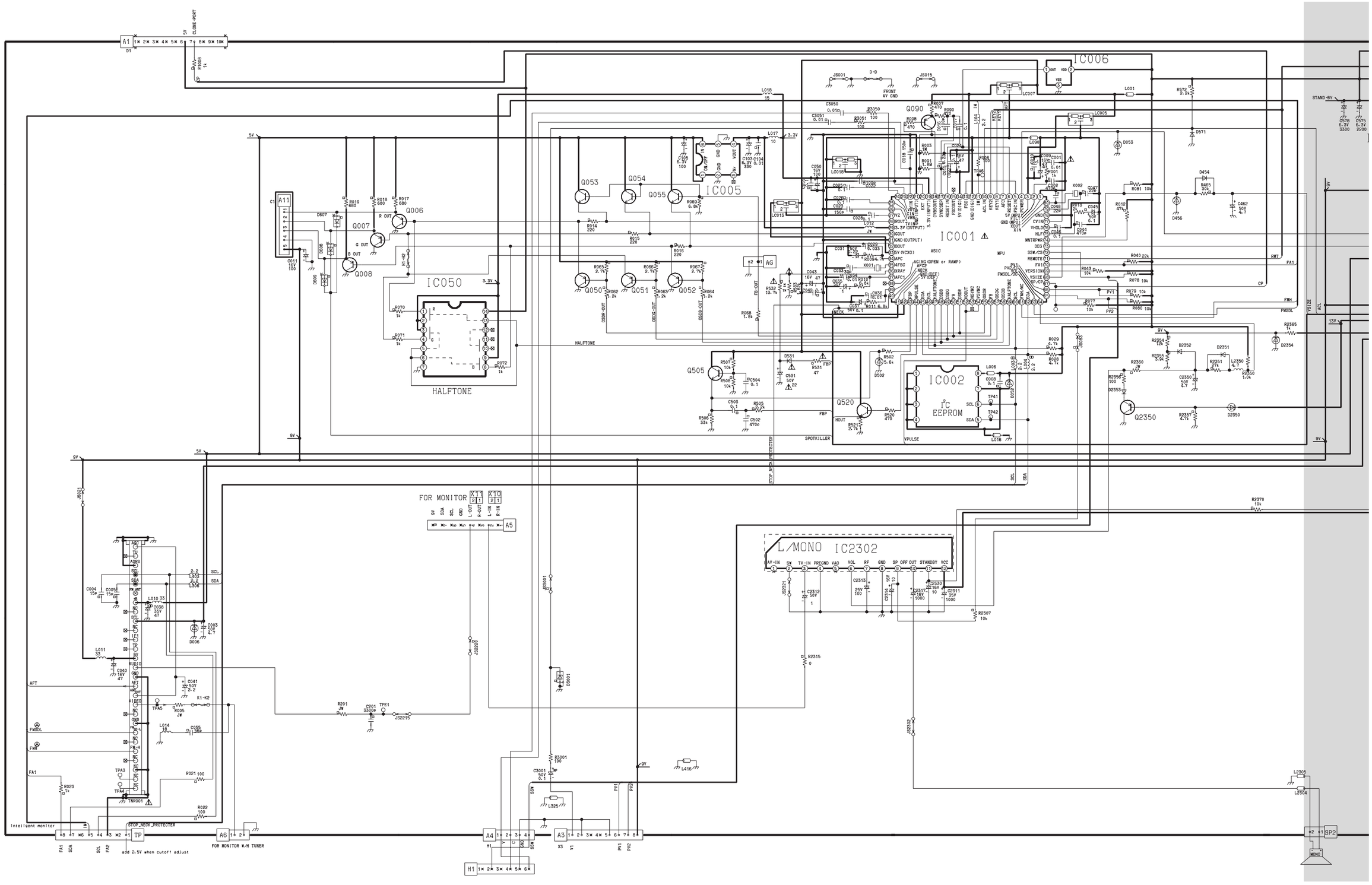

TNP2AH024EN
A
IC451
V.OUT
IC553
IC552
IC551
IC801
Q092
Q001
Q451
Q452
Q453
Q501
Q551
Q605
Q606
Q820
Q830
Q009
SPOT KILLER
OCP
OVP
COLD
HOT
DEG
ACCORD
NECK PROTECTOR
H. DRIVE
H. OUT
START
REG.
LATCH
DRIVE
T.S.D
O.S.C
O.V.P
STAND-BY
TV/VID
ACTION
CH UP
CH DWN
VOL UP
VOL DWN
POWER
AUDIO B+
SP2
MONO
HEATER GND
HEATER
220V

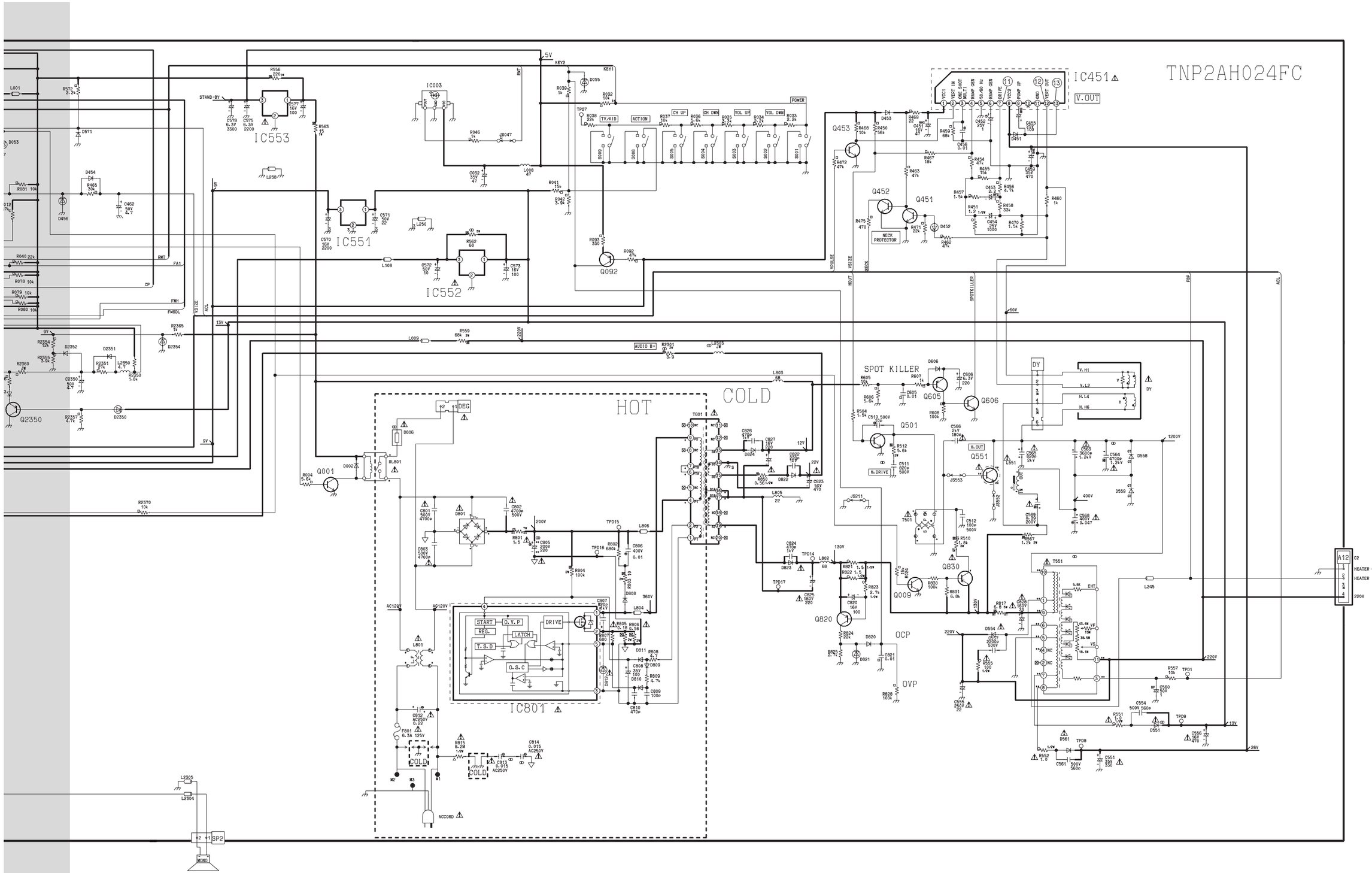
A-Board Schematic Left Portion -- Diagrama Eléctrico Tarjeta-A Porcion Izquierda




TNP2AH024FB
IC451
V.OUT
IC553
IC551
IC552
IC801
Q092
Q452
Q451
Q453
NECK PROTECTOR
SPOT KILLER
Q605
Q606
Q501
Q551
Q009
Q830
Q820
OCP
OVP
HOT
COLD
DY
H.OUT
H.DRIVE
POWER
CH UP
CH DWN
VOL UP
VOL DWN
TV/VID
ACTION
KEY1
KEY2
5V
9V
13V
26V
60V
200V
220V
400V
1200V
AUDIO B+
AC120V
STAND-BY
SP2
MONO
HEATER GND
HEATER
220V

A-Board Schematic Left Portion -- Diagrama Eléctrico Tarjeta-A Porcion Izquierda

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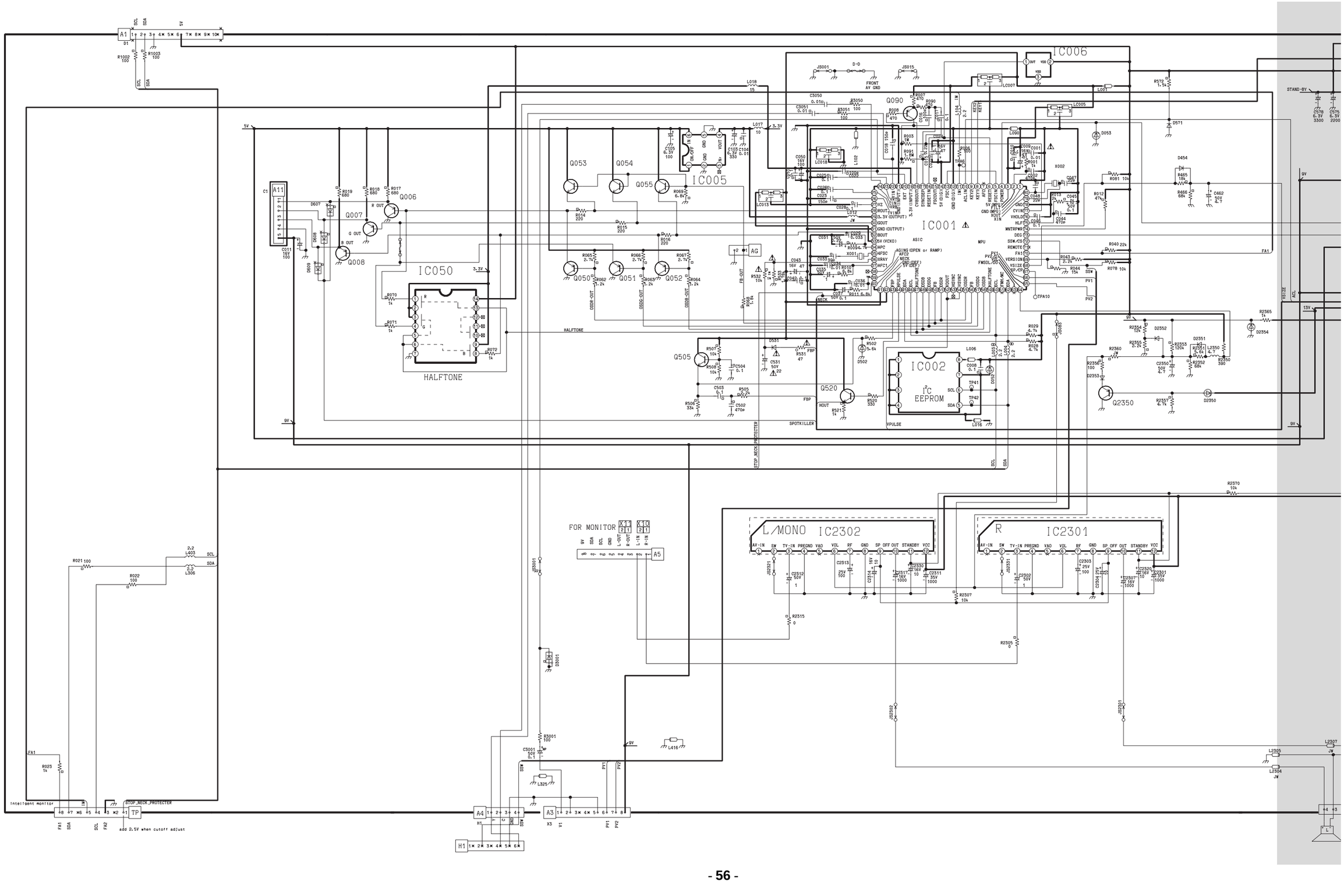
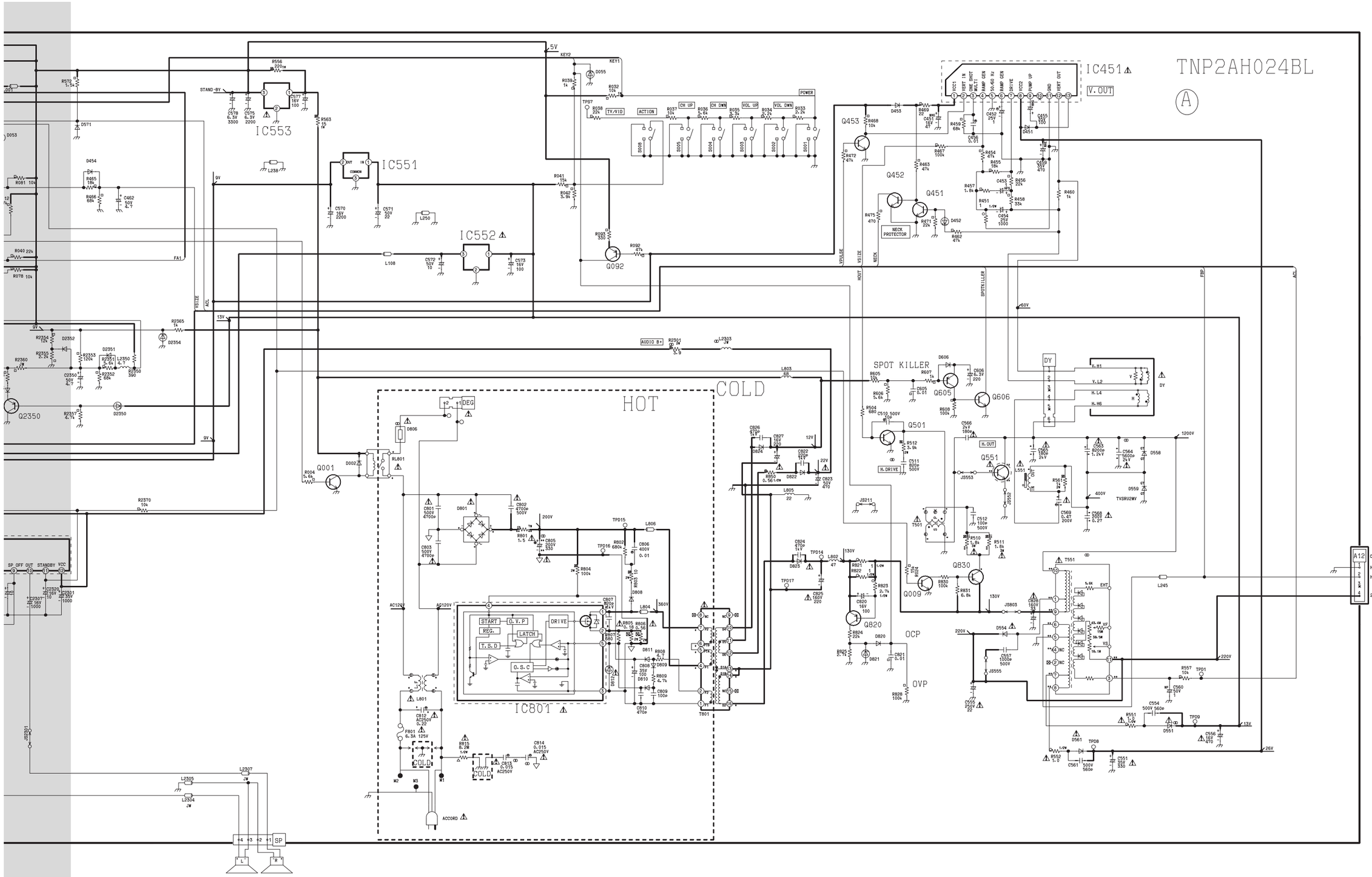
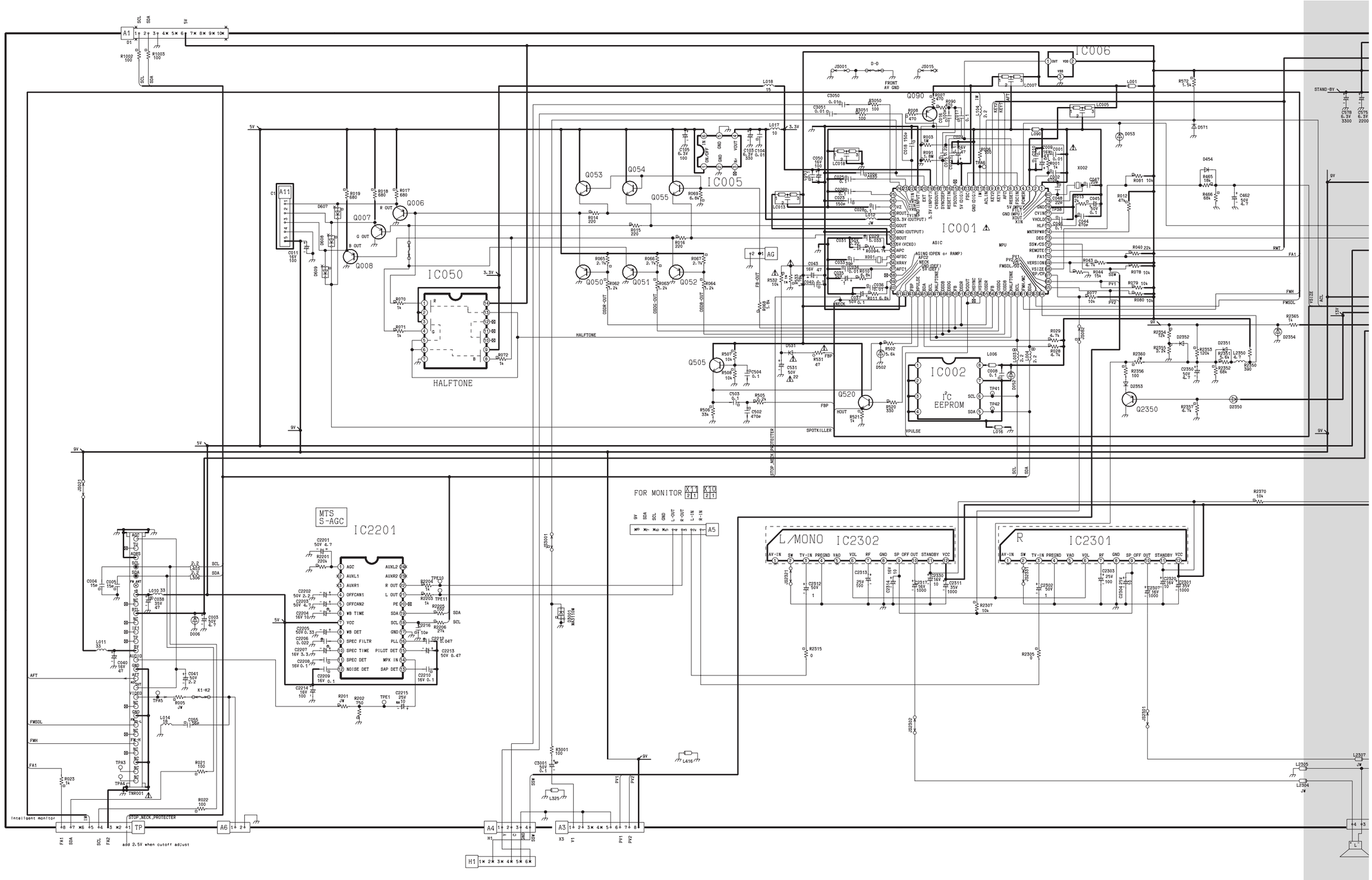
IC451
V.OUT
IC553
IC551
IC552
IC801
IC003
Q092
Q451
Q452
Q453
Q501
Q551
Q606
Q820
Q830
Q009
Q001
Q2350
SPOT KILLER
HOT
COLD
OCP
OVP
NECK PROTECTOR
H.DRIVE
H.OUT
STAND-BY
POWER
TV/VID
ACTION
CH UP
CH DWN
VOL UP
VOL DWN
START
REG.
LATCH
T.S.D
O.S.C
DRIVE
O.V.P
ACCORD
MONO
SP2
A12
HEATER GND
HEATER
220V

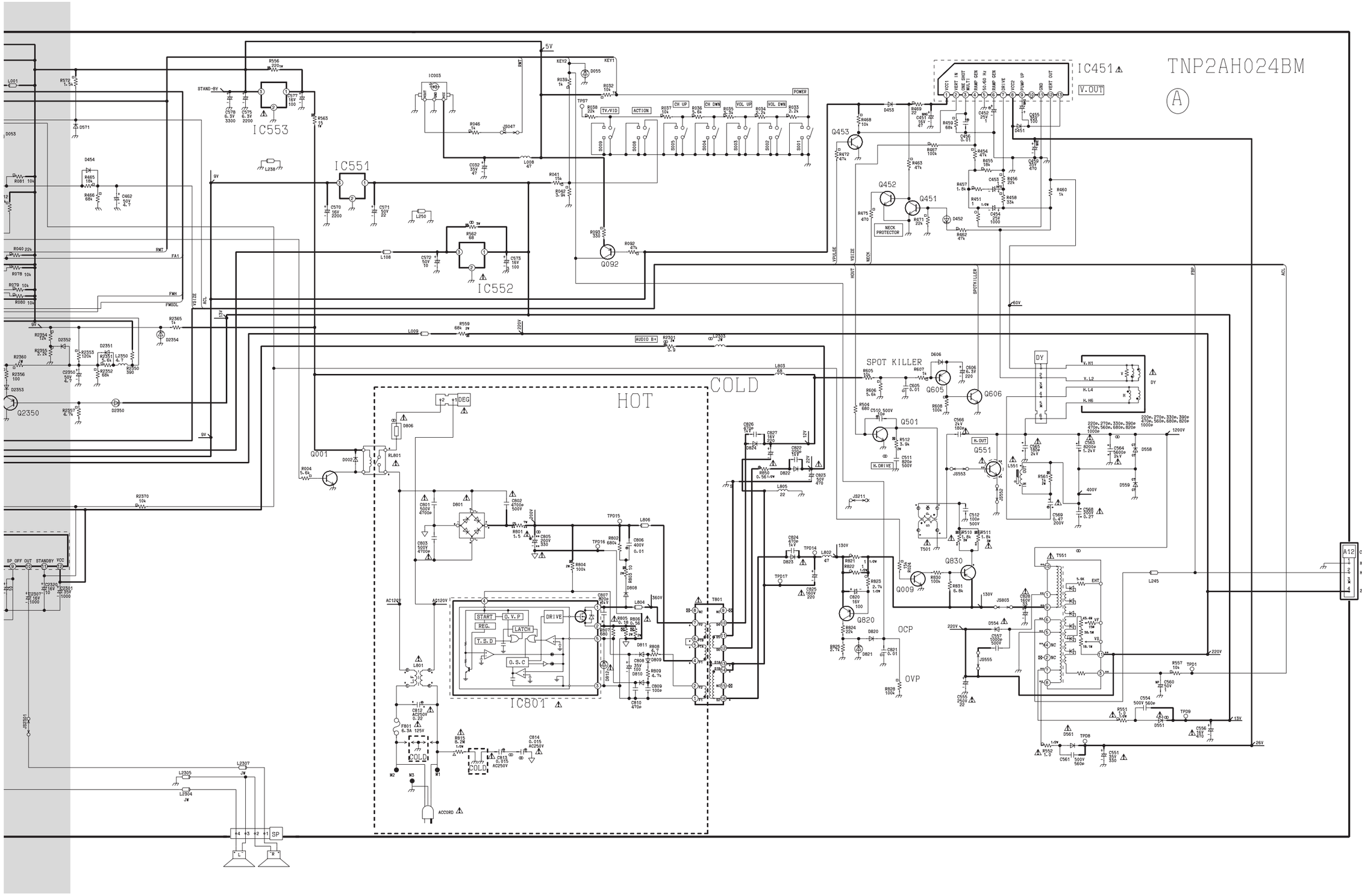
A-Board Schematic Left Portion -- Diagrama Eléctrico Tarjeta-A Porcion Izquierda



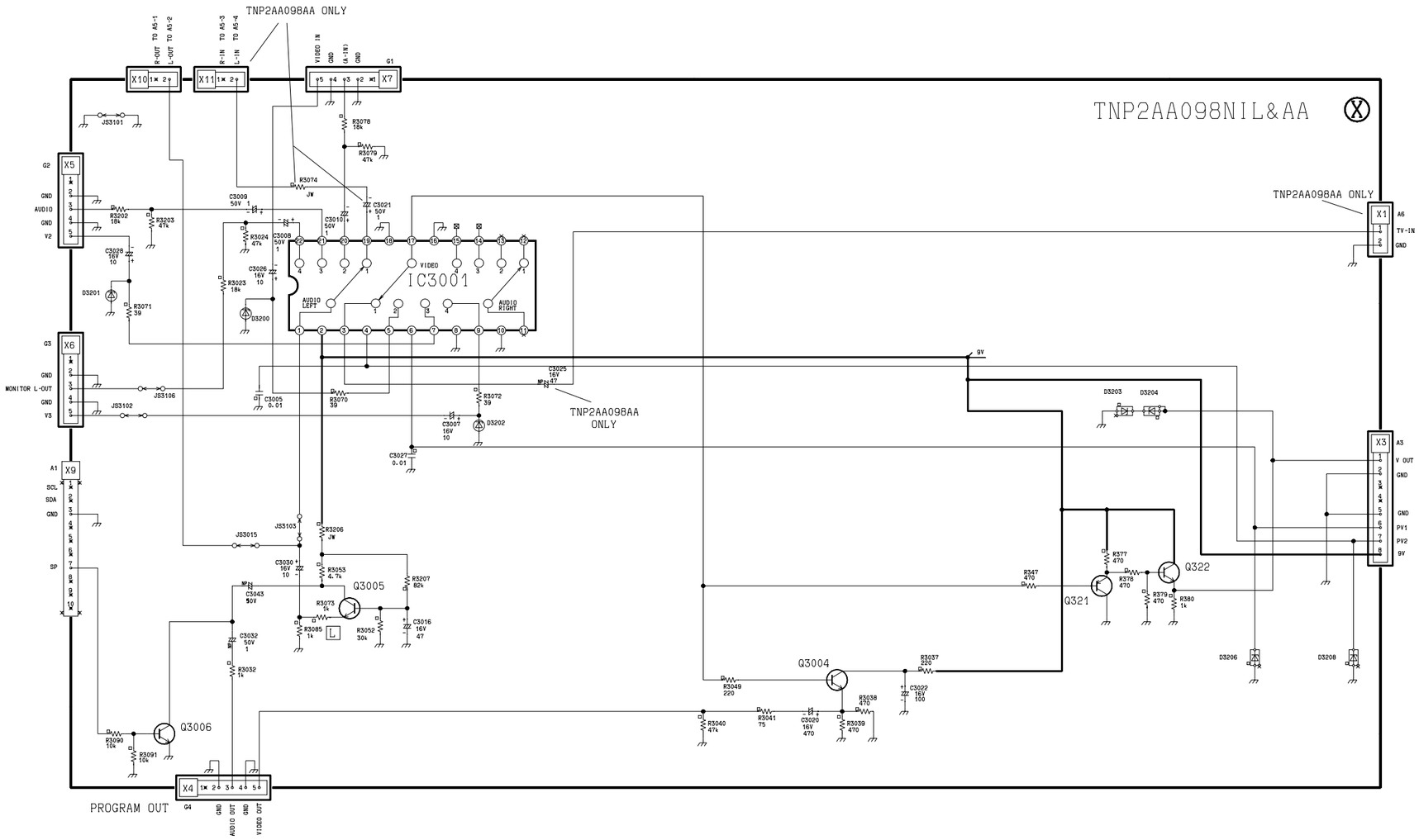

TNP2AH024BL
A
IC451
V. OUT
IC553
IC551
IC552
IC801
Q092
Q453
Q452
Q451
Q2350
Q001
Q501
Q605
Q606
Q551
Q009
Q830
Q820
SPOT KILLER
COLD
HOT
DEG
NECK PROTECTOR
H. OUT
H. DRIVE
OCP
OVP
START
G.V.P
REG.
T.S.D
LATCH
DRIVE
O.S.C
STAND-BY
AUDIO B+
SP OFF OUT
STANDBY
VCC
SP
L
R
ACCORD
TVSRU2MV
5V
9V
13V
26V
60V
130V
200V
220V
400V
1200V

A-Board Schematic Left Portion -- Diagrama Eléctrico Tarjeta-A Porcion Izquierda




TNP2AH024BM
A
IC451
V.OUT
IC553
IC551
IC552
IC801
HOT
COLD
SPOT KILLER
NECK PROTECTOR
OCP
OVP
START
O.V.P
REG.
LATCH
DRIVE
T.S.D
O.S.C
H.DRIVE
H.OUT
DY
STAND-BY
AUDIO B+
ACCORD
SP OFF OUT
STANDBY
VCC
SP
HEATER GND
HEATER
220V

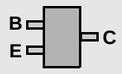
X-Board Schematics -- Diagrama Eléctrico Tarjeta-X



X-Board IC Voltages

IC3001	
1	4.10
2	8.93
3	3.37
4	0.00
5	3.37
6	0.00
7	3.37
8	0.0
9	3.38
10	0.00
11	4.06
12	4.74
13	4.76
14	4.76
15	4.76
16	0.00
17	3.97
18	0.00
19	4.77
20	4.79
21	4.79
22	4.79

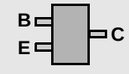
IDENTIFICACIÓN DE TERMINALES PARA TRANSISTORES EN *CHIP*



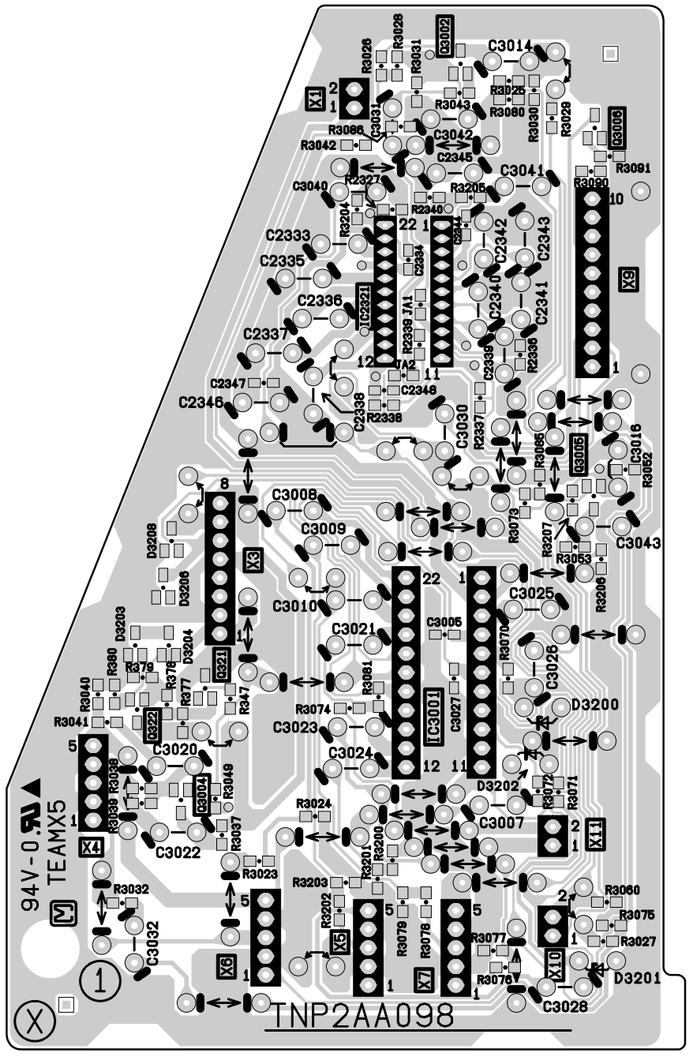
X-Board Transistors Voltages

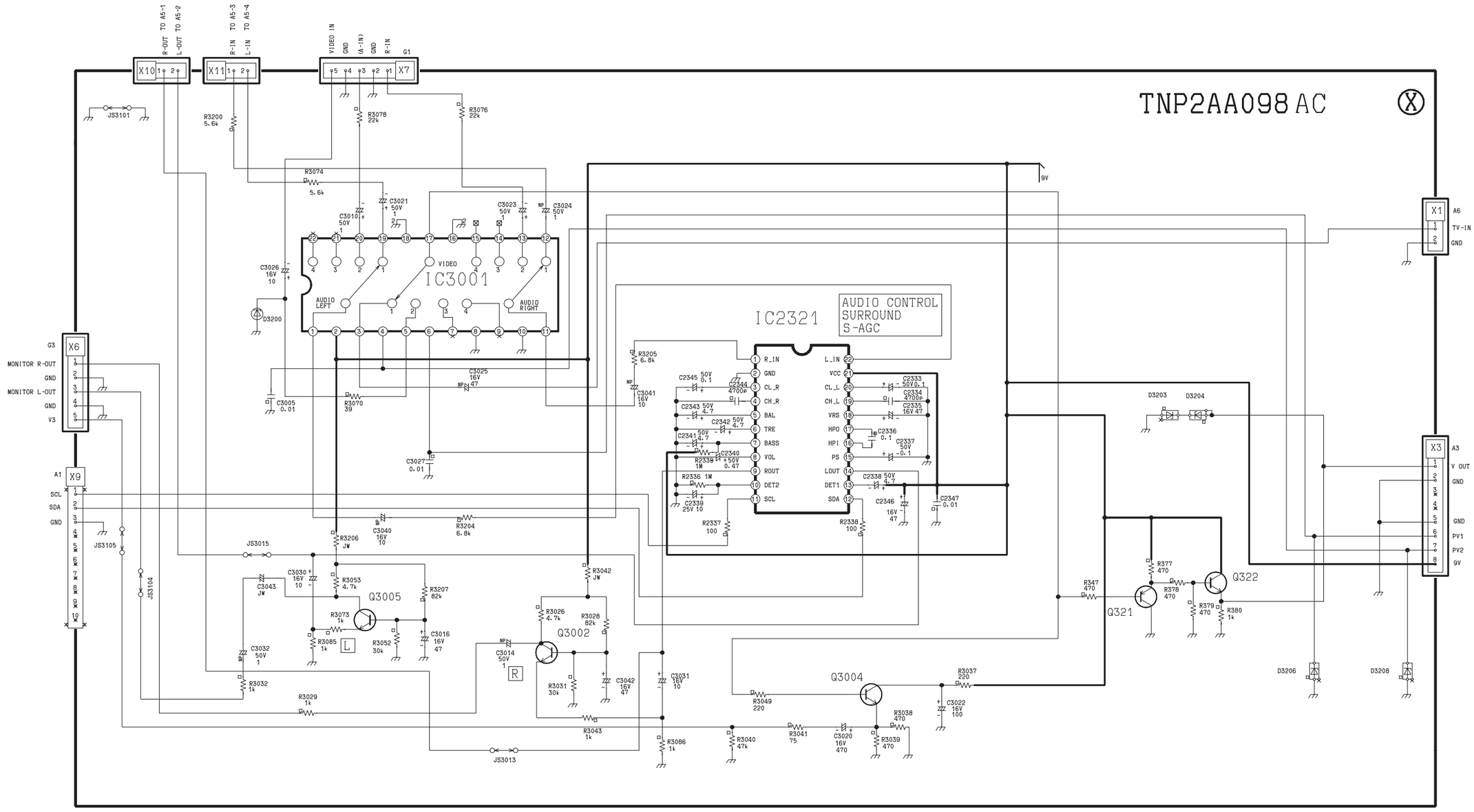
	Q3004	Q3005	Q3006	Q321	Q322
B	3.96	2.34	0.00	3.98	2.30
C	5.91	4.89	0.50	0.00	8.93
E	3.27	1.71	0.00	4.66	1.68

CHIP TRANSISTOR LEAD DESIGNATION

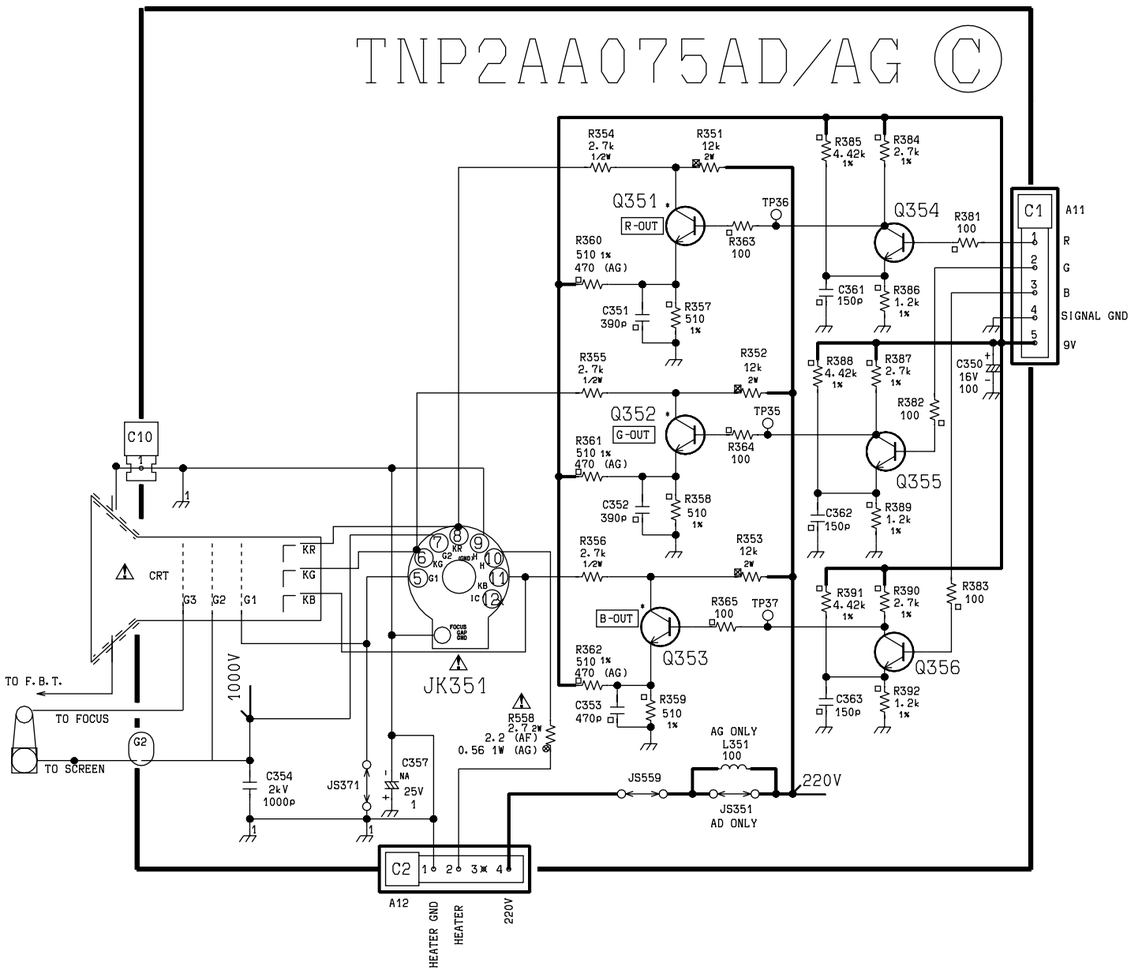


X-Board Layout -- Diagrama Impreso Tarjeta-X

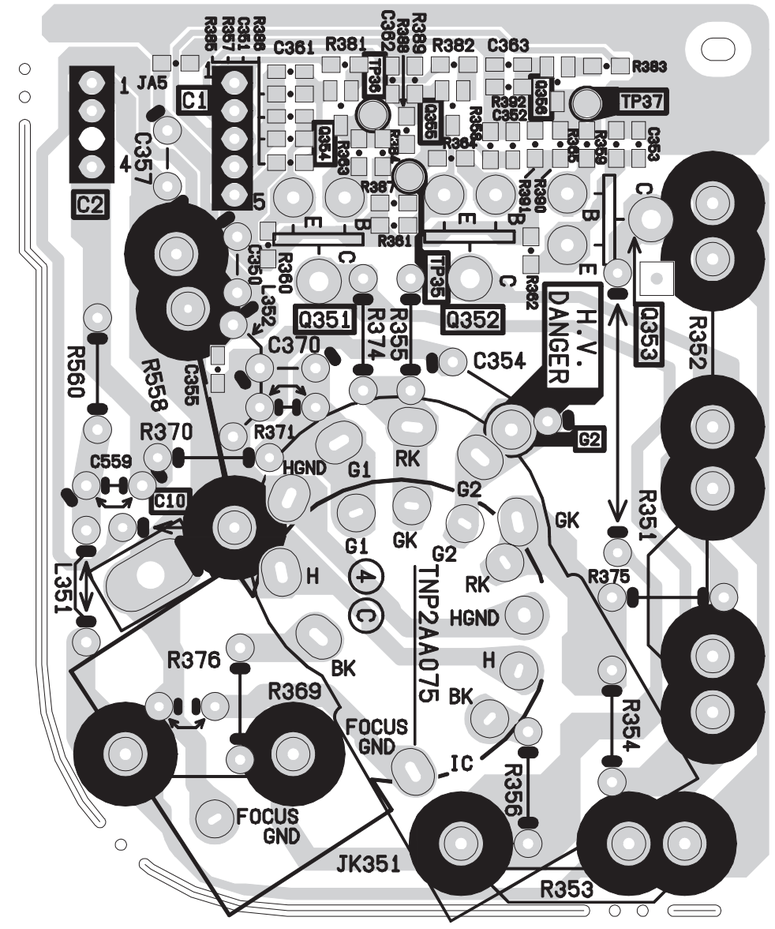



TNP2AA098 AC
X
X10
X11
X7
X6
X9
X1
X3
R-OUT
L-OUT
R-IN
L-IN
VIDEO IN
GND
(A-IN)
G1
TO A5-1
TO A5-2
TO A5-3
TO A5-4
JS3101
R3200 5.6k
R3078 22k
R3076 22k
R3074 5.6k
C3021 50V 1
C3010 50V 1
C3023 50V 1
C3024 50V 1
C3026 16V 10
D3200
IC3001
VIDEO
AUDIO LEFT
AUDIO RIGHT
C3005 0.01
C3025 16V 47
R3070 39
C3027 0.01
R3205 6.8k
C3041 16V 10
IC2321
AUDIO CONTROL
SURROUND
S-AGC
R_IN
GND
CL_R
CH_R
BAL
TRE
BASS
VOL
ROUT
DET2
SCL
L_IN
VCC
CL_L
CH_L
VRS
HPO
HPI
PS
LOUT
DET1
SDA
C2345 50V 0.1
C2344 4700P
C2343 50V 4.7
C2342 50V 4.7
C2341 50V 4.7
C2339 25V 10
C2340 50V 0.47
R2339 1M
R2336 1M
R2337 100
R2338 100
C2333 50V 0.1
C2334 4700P
C2335 16V 47
C2336 0.1
C2337 50V 0.1
C2338 50V 4.7
C2346 16V 47
C2347 0.01
9V
TV-IN
GND
A6
A3
V OUT
GND
GND
PV1
PV2
9V
D3203
D3204
D3206
D3208
R377 470
R378 470
R379 470
R380 1k
Q322
Q321
R347 470
MONITOR R-OUT
GND
MONITOR L-OUT
GND
V3
SCL
SDA
GND
JS3105
JS3104
JS3015
JS3013
C3030 16V 10
C3043 JW
R3053 4.7k
R3207 82k
Q3005
R3073 1k
R3085 1k
R3052 30k
C3016 16V 47
C3032 50V 1
R3032 1k
R3029 1k
R3206 JW
C3040 16V 10
R3204 6.8k
R3042 JW
R3026 4.7k
R3028 82k
Q3002
C3014 50V 1
R3031 30k
C3042 16V 47
C3031 16V 10
R3043 1k
R3086 1k
R3040 47k
R3041 75
C3020 16V 470
Q3004
R3049 220
R3037 220
C3022 16V 100
R3038 470
R3039 470
L
R

C-Board Schematic (CT-2088YD, CT-2089VYD, CT-2788YD, CT-2789VYD)



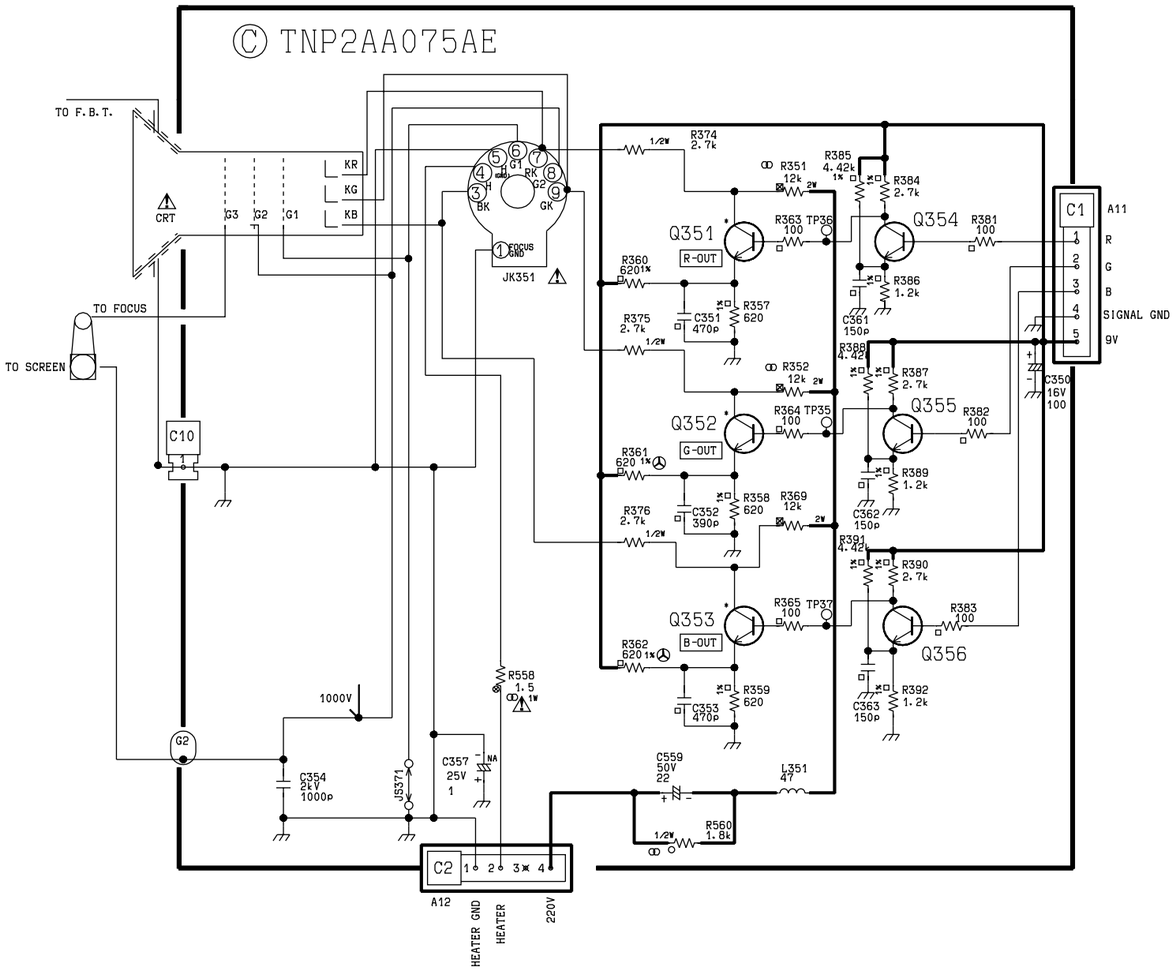
C-Board Layout



C-Board voltages

	Q351	Q352	Q353	Q354	Q355	Q356
B	6.60	6.40	6.50	3.38	3.38	3.32
C	163.30	165.30	164.00	6.58	6.41	6.49
E	6.10	6.10	6.00	2.74	2.80	2.76

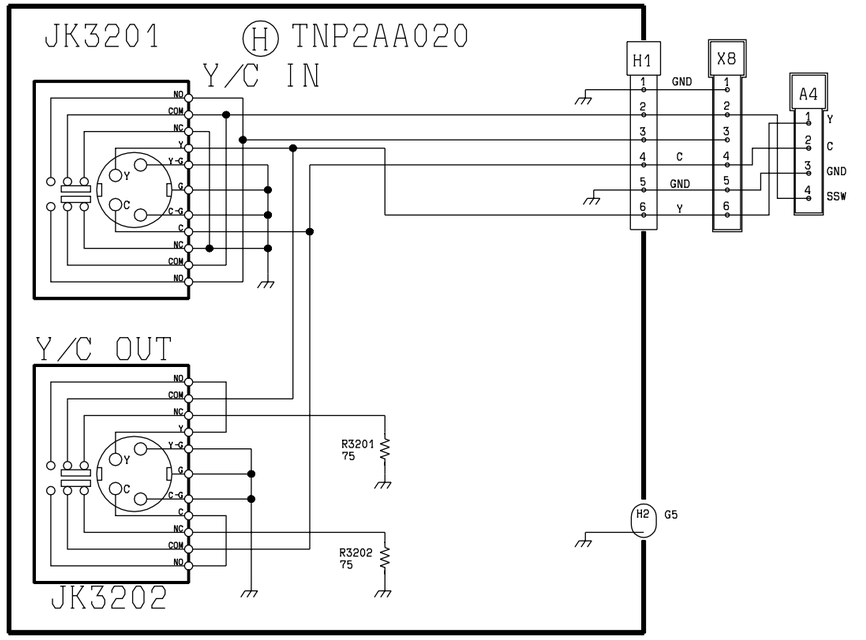
C-Board Schematic (CT-1388YD, CT-1389VYD)



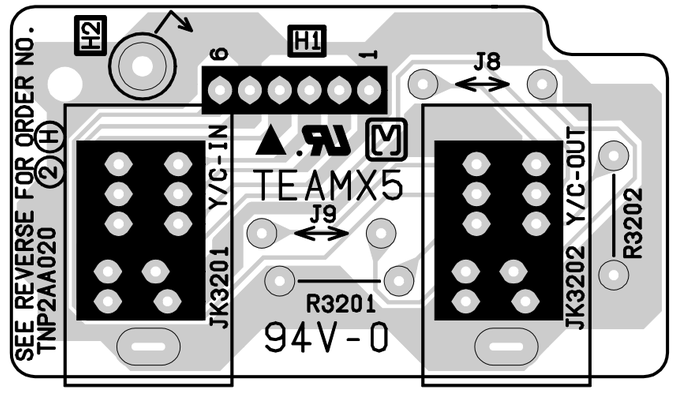
C-Board voltages

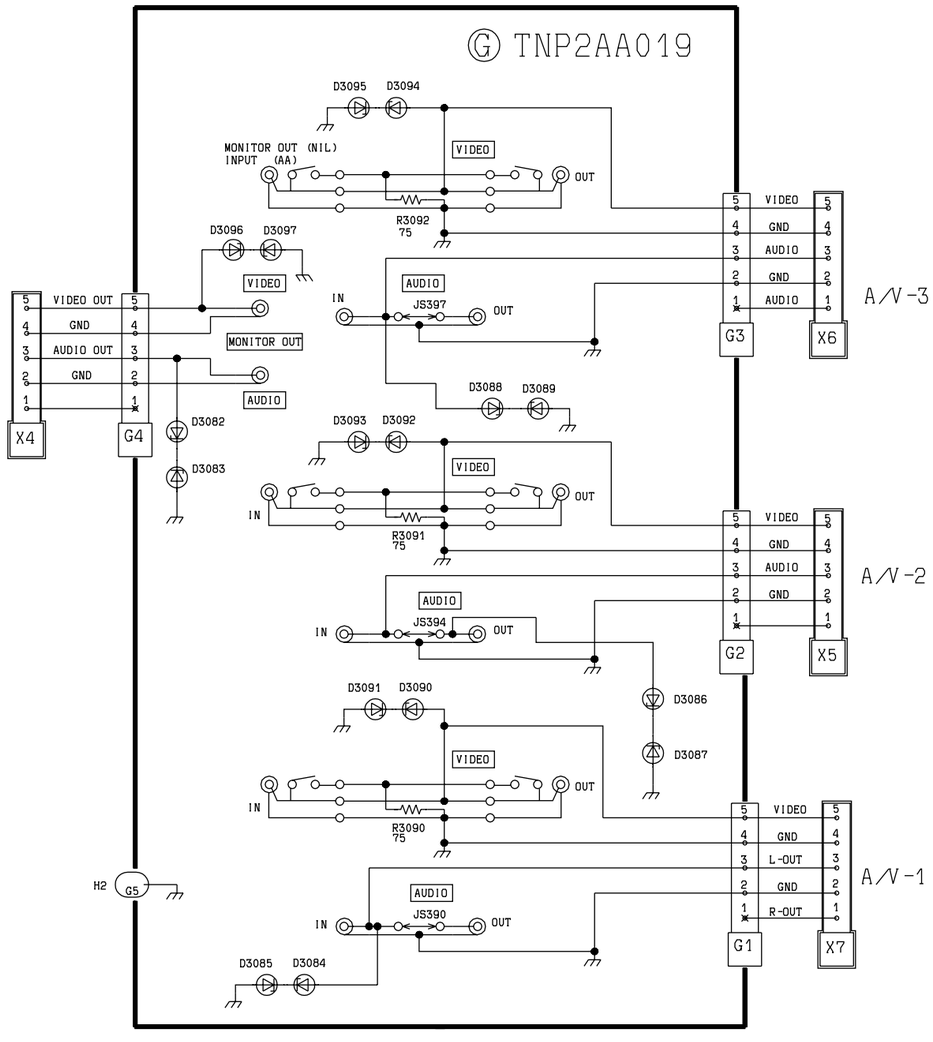
	Q351	Q352	Q353	Q354	Q355	Q356
B	6.45	6.20	6.40	3.30	3.40	3.40
C	112.00	122.20	113.50	6.40	6.20	6.50
E	5.90	5.70	5.90	2.70	2.90	2.80

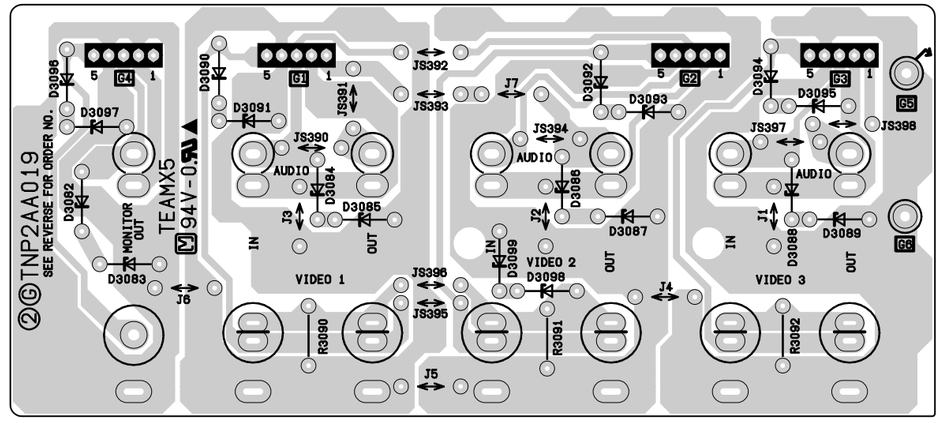
H-Board Schematic



H-Board Layout

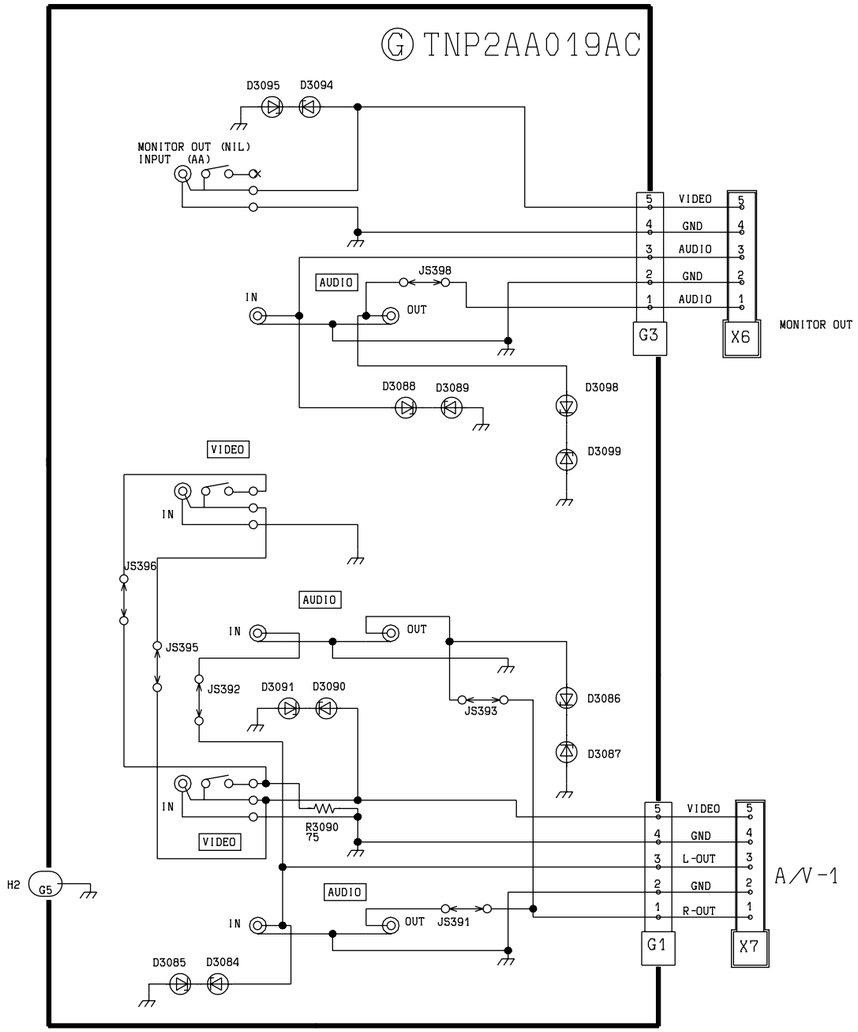



Ⓖ TNP2AA019
D3095
D3094
MONITOR OUT (NIL)
INPUT (AA)
VIDEO
OUT
R3092
75
D3096
D3097
VIDEO
AUDIO
IN
JS397
OUT
VIDEO OUT
GND
AUDIO OUT
GND
MONITOR OUT
AUDIO
X4
G4
D3082
D3083
D3088
D3089
D3093
D3092
VIDEO
IN
OUT
R3091
75
AUDIO
JS394
IN
OUT
D3091
D3090
VIDEO
IN
OUT
R3090
75
AUDIO
JS390
IN
OUT
D3085
D3084
H2
G5
D3086
D3087
VIDEO
GND
AUDIO
GND
AUDIO
G2
X5
VIDEO
GND
L-OUT
GND
R-OUT
G1
X7
A/V-3
A/V-2
A/V-1

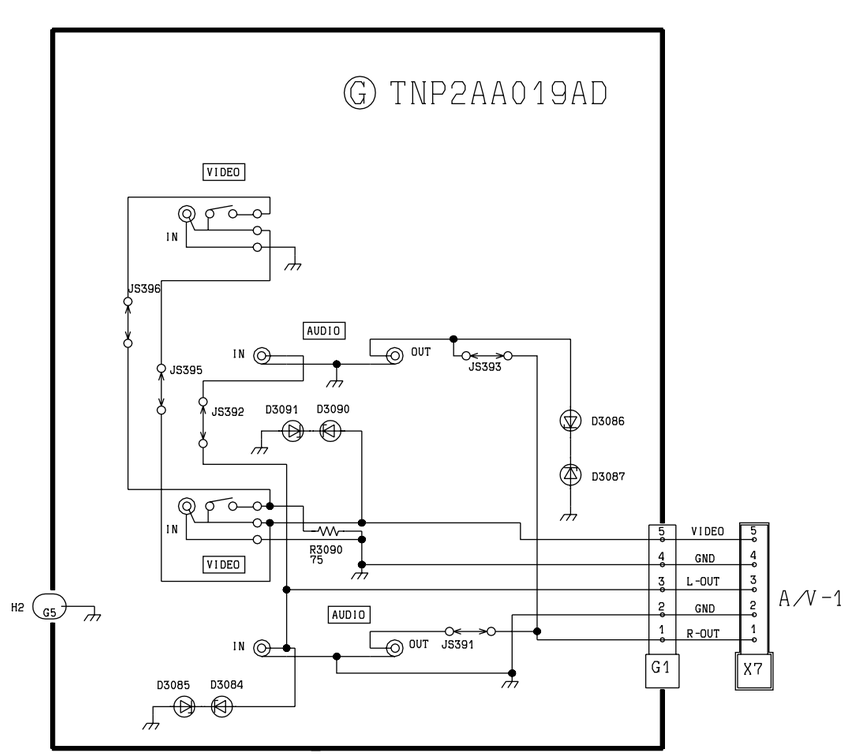

Ⓖ TNP2AA019
SEE REVERSE FOR ORDER NO.
TEAMX5
94V-0
G4
G1
G2
G3
G5
G6
D3096
D3097
D3082
MONITOR OUT
D3083
J6
D3090
D3091
JS391
JS390
AUDIO
D3084
D3085
J3
IN
OUT
VIDEO 1
R3090
JS392
JS393
J7
D3092
D3093
JS394
AUDIO
D3086
J2
D3087
D3099
IN
VIDEO 2
OUT
D3098
JS396
JS395
J5
R3091
J4
D3094
D3095
JS397
JS398
AUDIO
D3088
D3089
J1
IN
OUT
VIDEO 3
R3092

G-Board Schematic - Diagrama Eléctrico Tarjeta-G

G-Board CT-2789VYD



G-Board CT-2788YD



A-Board Voltages

IC001

1	0.00	41	0.00
2	1.20	42	5.00
3	5.00	43	0.00
4	4.95	44	1.75
5	2.21	45	4.06
6	5.00	46	3.68
7	1.48	47	0.00
8	5.01	48	5.00
9	2.72	49	5.00
10	2.24	50	0.00
11	4.97	51	5.00
12	0.00	52	0.00
13	2.51	53	0.48
14	5.00	54	0.00
15	2.49	55	5.00
16	5.00	56	0.00
17	2.85	57	5.00
18	1.19	58	5.00
19	3.23	59	0.00
20	0.88	60	3.69
21	0.00	61	0.00
22	0.52	62	4.09
23	1.72	63	0.65
24	1.09	64	0.25
25	0.45	65	0.00
26	0.53	66	0.00
27	2.04	67	0.00
28	2.64	68	0.65
29	3.29	69	0.78
30	2.78	70	1.35
31	0.00	71	4.67
32	2.69	72	0.00
33	5.00	73	0.00
34	2.83	74	4.99
35	2.58	75	2.05
36	2.69	76	0.30
37	2.41	77	1.94
38	3.51	78	0.00
39	3.64	79	2.18
40	2.51	80	2.18

IC002

1	0.00
2	0.00
3	0.00
4	0.00
5	4.12
6	2.88
7	0.00
8	5.02

IC003

1	4.90
2	0.00
3	5.01

IC005

1	5.01
2	0.00
3	1.30
4	3.29
5	0.00
6	5.01

IC006

1	5.00
2	5.00
3	0.00

IC050

1	2.65
2	3.09
3	3.23
4	2.78
5	0.00
6	0.00
7	0.00
8	2.69
9	3.23
10	0.00
11	0.00
12	0.00
13	0.00
14	5.02

IC2302

1	13.71
2	0.00
3	13.76
4	0.00
5	9.98
6	1.98
7	17.26
8	0.00
9	4.99
10	9.10
11	3.54
12	19.12

IC451

1	8.22
2	8.65
3	4.11
4	4.18
5	0.00
6	4.15
7	3.78
8	22.71
9	1.77
10	1.38
11	0.00
12	4.56
13	23.13

IC551

1	13.43
2	0.00
3	8.94

IC552

1	13.43
2	0.00
3	5.01

IC553

1	8.80
2	0.00
3	5.02

IC801

1	98.8
2	0.10
3	0.00
4	31.97
5	1.66

	Q001	Q006	Q007
B	0.00	2.64	2.77
C	11.07	0.00	0.00
E	0.00	3.31	3.44

	Q008	Q009	Q050
B	2.69	0.60	4.68
C	0.00	0.00	0.00
E	3.36	0.00	2.72

	Q051	Q052	Q053
B	5.00	5.00	0.00
C	0.00	0.00	5.01
E	2.77	2.69	2.64

	Q054	Q055	Q090
B	0.00	0.00	1.21
C	5.00	5.01	0.00
E	2.77	2.69	1.90

	Q092	Q2350	Q451
B	8.89	6.61	0.61
C	2.72	0.00	0.00
E	5.02	1.84	1.84

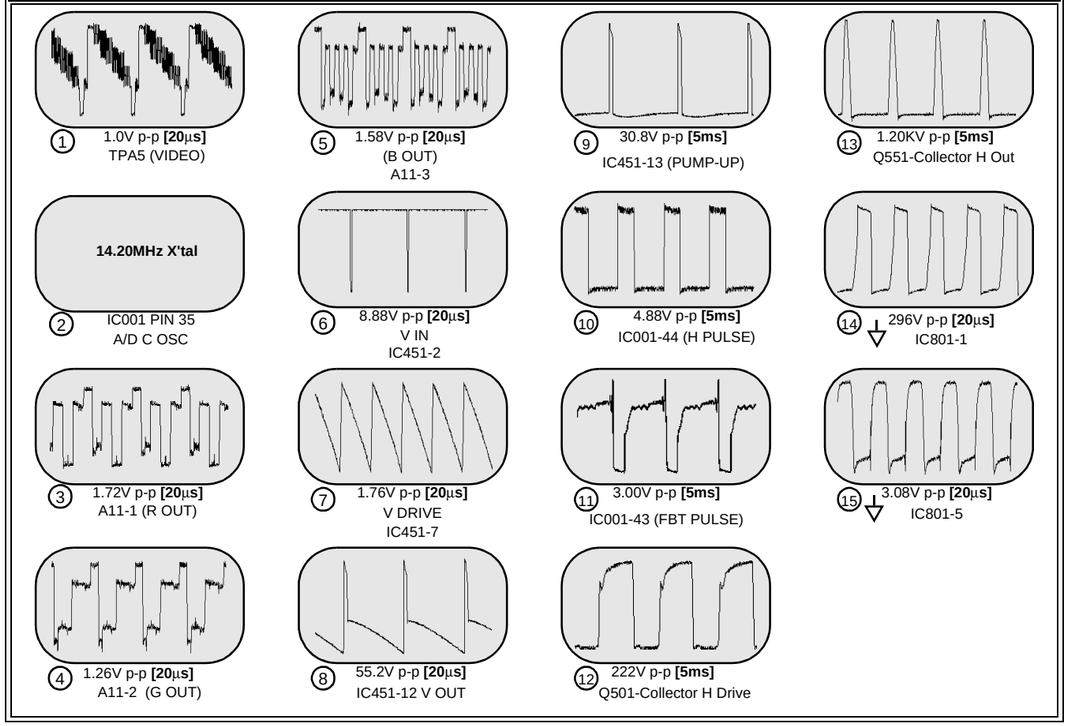
	Q452	Q453	Q501
B	0.00	0.00	0.50
C	2.52	8.70	65.30
E	0.00	0.00	0.00

	Q505	Q520	Q551
B	2.48	1.75	0.00
C	5.00	5.00	14.70
E	2.33	1.70	0.00

	Q605	Q606	Q820
B	4.03	0.00	130.2
C	0.00	3.54	0.00
E	4.01	0.00	130.5

	Q830
B	129.5
C	128.8
E	130.2

A-Board Waveforms


1 1.0V p-p [20µs] TPA5 (VIDEO)
5 1.58V p-p [20µs] (B OUT) A11-3
9 30.8V p-p [5ms] IC451-13 (PUMP-UP)
13 1.20KV p-p [5ms] Q551-Collector H Out
14.20MHz X'tal
2 IC001 PIN 35 A/D C OSC
6 8.88V p-p [20µs] V IN IC451-2
10 4.88V p-p [5ms] IC001-44 (H PULSE)
14 296V p-p [20µs] IC801-1
3 1.72V p-p [20µs] A11-1 (R OUT)
7 1.76V p-p [20µs] V DRIVE IC451-7
11 3.00V p-p [5ms] IC001-43 (FBT PULSE)
15 3.08V p-p [20µs] IC801-5
4 1.26V p-p [20µs] A11-2 (G OUT)
8 55.2V p-p [20µs] IC451-12 V OUT
12 222V p-p [5ms] Q501-Collector H Drive

A-Board Voltages (CT-2789VYD)

IC451

1	8.26
2	8.71
3	4.13
4	4.18
5	0.00
6	4.15
7	2.88
8	26.82
9	2.84
10	1.28
11	0.00
12	15.78
13	27.73

IC801

1	50.10
2	0.00
3	0.00
4	32.10
5	1.76

IC2201

1	1.30
2	2.19
3	2.19
4	2.31
5	2.18
6	0.36
7	4.96
8	2.47
9	2.44
10	0.46
11	2.28
12	3.08

IC2301

1	13.24
2	0.00
3	13.27
4	0.00
5	9.51
6	3.98
7	16.69
8	0.00
9	4.97
10	8.35
11	3.06
12	18.44
13	3.35
14	2.18
15	3.36
16	3.48
17	0.00
18	3.24
19	3.55
20	0.00
21	2.24
22	2.20
23	2.19
24	2.19

NOTES

NOTES:

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